

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

VOITH PAPER GMBH & CO. KG.,	)	
	)	
Plaintiff,	)	
	)	
v.	)	Civil Action No. 07-226 (JJF)
	)	
JOHNSONFOILS, INC.,	)	
	)	
Defendant.	)	

**PLAINTIFF VOITH PAPER  
GMBH & CO. KG'S SUPPLEMENTAL MARKMAN BRIEF**

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Voith Paper GmbH & Co. KG (“Voith”) hereby supplements its Opening Markman Brief (“Voith’s Opening Brief”) (D.I. 65) in order to address issues and terms raised in JohnsonFoils Inc.’s (“JohnsonFoils”) Opening Claim Construction Brief (“JohnsonFoils’ Opening Brief”) (D.I. 68), relating to the construction of U.S. Patent Nos. 5,718,805 (“the ’805 patent”) and 5,972,168 (“the ’168 patent”), Exh.’s 1 and 2, respectively, to Voith’s Opening Brief. As explained in detail in Voith’s Opening Brief in Support of Voith’s Motion for Leave to Supplement Voith’s Opening Markman Brief, filed concurrently herewith, Voith attempted unsuccessfully to negotiate a briefing schedule with JohnsonFoils which would have permitted each party the opportunity to file a responsive brief. Voith also attempted, through interrogatories and letters, to ascertain the claim terms which were arguably in dispute, but JohnsonFoils failed to provide responses despite not having contested Voith’s pending Motion to Compel with respect to its deficient interrogatory answers. Voith submits this Supplemental Markman Brief in order to clarify Voith’s position on construction of claim terms construed in JohnsonFoils’ Opening Brief.

## **I. CLAIM CONSTRUCTIONS**

### **A. Level of Ordinary Skill**

JohnsonFoils’ constructions are predicated on understating the level of ordinary skill required to understand the claimed invention. JohnsonFoils states that the person of ordinary skill in the art has no academic training and has familiarity with the components of the claimed combination as would be obtained from two years experience in paper making. JohnsonFoils’ Opening Brief, at p. 14. JohnsonFoils’ sole support for this low level of skill is the patent specifications’ assertion that the components used to comprise the claimed invention were “known features.” *Id.* However, although the components comprising the invention were

known, evaluating the consequences of combining the known components as claimed requires an appreciation of the effect of the claimed combination on the complex process of paper web formation. Supplemental Declaration of Michael H. Waller (“Supplemental Waller Declaration”) at ¶ 7. For example, the patent describes processes in which the liquid fiber suspension center of the web must be agitated to prevent flocculation while taking care to avoid breaking the partially formed web and retaining additives. *Id.* at ¶ 8. To appreciate the effect of paper machine components on this complex process requires an understanding of, for example, physics, chemistry, mechanics, and fluid dynamics, as would be obtained in a course of study for an engineering degree, with additional specialized training on applying that theoretical background to paper making. *Id.* at ¶ 9. With the aid of such training, a person of ordinary skill would understand that changes in the specific geometry or shape of the paper forming path would influence the forces applied to the web during the formation process. *Id.* at ¶ 10. Accordingly, Voith contends that the level of ordinary skill is “a person of ordinary skill in the art as of 1989 was someone with an engineering degree and 1-3 years of experience working with paper making machines.” Voith’s Opening Brief, at p. 20.

#### **B. Claim Terms of Claim 1 of the ’805 Patent**

JohnsonFoils has selected for construction many ordinary English words which have no special meaning in the paper making machine art or in the Patents-in-suit. Voith does not agree that such terms should be construed, but provides an alternative construction for the purpose of illustrating the differences between JohnsonFoils’ proposed construction and the correct, plain and ordinary meaning.

In addition, contrary to settled canons of claim construction, many of JohnsonFoils’ proposed constructions add limitations from the specification in the absence of any indication

that the claim terms are being used in a way different from their ordinary English sense, or, where technical, as would be understood by one of ordinary skill in the art. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (Federal Circuit has repeatedly warned against confining claims to preferred embodiments).

JohnsonFoils' proposed constructions are also infected throughout by JohnsonFoils' attempt to improperly limit open claim terms to exclude devices with unrecited elements from their scope. It is settled law that the words "comprising" and "includes" signal open limitations. *See Sandisk Corp. v. Memorex Prods., Inc.*, 415 F.3d 1278, 1284 (Fed. Cir. 2005) ("includes" and "comprising" are open claim terms that do not exclude unrecited elements). As explained further below, by ignoring the fact that these limitations are open, many of JohnsonFoils' proposed constructions exclude the disclosed preferred embodiments. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 2005) (a claim construction that excludes preferred embodiments is "rarely, if ever, correct").

Finally, JohnsonFoils' attempts to modify the plain and ordinary meaning of the claims by reference to the prosecution history of the Patents-in-suit is unavailing. When interpreted properly in the context of the claims, the specification, and the prosecution history as a whole, the passages cited by JohnsonFoils clarify, but do not limit, the claims. *See Pharmacia & Upjohn Co v. Mylan Pharms., Inc.*, 170 F.3d 1373, 1377 (Fed. Cir. 1999) (to create an estoppel, disavowal of claim scope must be clear and unmistakable, not equivocal, surrender).

**1. “Following”**

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
Following	coming after [the previous section] in sequence and occupying a discrete physical space.	The word “following” does not require construction.

The term “following” is used in Patents-in-suit in its ordinary English sense of “coming after” and does not require construction. *See* Supplemental Waller Dec., ¶ 14. JohnsonFoils’ definition unnecessarily confuses this basic word by adding the concepts “sequence,” “discrete physical space,” and “previous section,” each of which would require further explanation. *Id.* For example, “discrete physical space” implies spaces that are isolated from one another. *Id.* Yet, the patent specification contains no disclosure that objects that follow one another in a paper making machine are in spaces that are isolated from one another. *Id.* at ¶ 15. Other than using the term “following” in claim phrases, the specification provides no support for requiring the use of these additional limiting concepts. *Id.* at ¶ 16. Accordingly, Voith proposes that the term following not be construed. However, if the Court does offer a construction, the ordinary English sense of “coming after” adequately captures the meaning of this word in the context of the Patents-in-suit. *Id.* at ¶ 17.

## 2. “Neither wire belt defining a single wire predrainage zone”

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
Neither wire belt defining a single wire pre-drainage zone	neither wire belt has any single wire predrainage	<p>Voith contends that once “single wire predrainage zone” is construed, there is no need to further construe “neither wire belt defining a single wire predrainage zone” because the additional words are used in their ordinary English sense.</p> <p>If construed, this phrase means “Neither wire belt defines a single wire predrainage zone, i.e. a zone in which the web is partially formed initially only in a lower layer of the fiber suspension while the upper layer remains liquid. E.g., as in first part of a hybrid former or in a Fourdrinier.</p>

Voith contends that once the technical terms “single wire predrainage zone” and “wire belt” are construed, there is no need to further construe “neither wire belt defining a single wire predrainage zone” because one of ordinary skill would understand the additional words to have their plain and ordinary English meaning. *See* Supplemental Waller Dec., ¶ 19. If construed, this phrase means “neither wire belt defines a single wire predrainage zone, i.e. a zone in which the web is partially formed initially only in a lower layer of the fiber suspension while the upper layer remains liquid. E.g., as in first part of a hybrid former or in a Fourdrinier.” *Id.* at ¶¶ 19-20; Voith Opening Brief, at p. 22.

JohnsonFoils’ proposed construction improperly changes the meaning of this claim phrase by dropping the word “zone” from “single wire predrainage zone.” Supplemental Waller Dec., ¶ 21. Because of this omission, JohnsonFoils’ construction misleadingly appears to exclude paper making machines in which any water is drained through a single wire belt, even if the paper making machine has no *zone* in which the web is partially formed on a single wire, as

in a hybrid former or Fourdrinier. *Id.* at ¶ 22. As explained in Voith's Opening Brief, this is contrary to the understanding of one of ordinary skill in the art reading the Patents-in-suit. *Id.* JohnsonFoils' citation to the prosecution history is unavailing because no amendment of this limitation during prosecution justifies altering the *literal* scope of this limitation as issued and as understood by one of ordinary skill.

### 3. "First Section"

Claim Term	JohnsonFoils' Proposed Construction	Voith's Proposed Construction
First Section	The components of the first section are: (a) "a first drainage element at the start of the path through the twin wire zone," (b) "means for supporting the belts for forming a wedge shaped entrance slot into the first section," and (c) "a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot[.]"	The first forming section of a twin wire former is where web formation begins.

JohnsonFoils' proposed construction of the term "First Section" is misleading because it implies that the First Section is limited to the components expressly enumerated in the claim. This is incorrect because the claimed Twin Wire Former *comprises*, but is not limited to, the enumerated elements. Supplemental Waller Dec., ¶ 24. In addition, the first section of the claimed Twin Wire Former *includes* the enumerated components, but does not exclude other components as suggested by JohnsonFoils' construction. *Id.* Both the claimed Twin Wire Former and its "first section" are *open* claim terms. See *Sandisk*, 415 F.3d at 1284 ("comprises" and "includes" are open claim terms). With open claim terms, the recitation of constituent elements provide a condition for being within the term's scope, but, once satisfied, that condition remains satisfied despite the addition of other elements. *Id.*

Voith's construction is consistent with the specification, which describes the formation of the web in the first section. Supplemental Waller Dec., ¶ 23; '805 Patent, Col. 4:6-16 (discussing the use of web forming elements in the first part of twin wire zone).

**4. "a first drainage element at the start of the path through the twin wire zone"**

<b>Claim Term</b>	<b>JohnsonFoils' Proposed Construction</b>	<b>Voith's Proposed Construction</b>
a first drainage element at the start of the path through the twin wire zone	either a suction roll or a curved stationary forming shoe within the twin wire zone that results in drainage from both sides of the twin wire zone	An element which removes water from the fiber suspension or web at the start of the path through the zone where web formation occurs in a Twin Wire Former.

Voith contends that, apart from the technical terms "drainage element" and "twin wire zone," this phrase does not require construction because one of ordinary skill would understand the other words to have their plain and ordinary English meaning. Supplemental Waller Dec., ¶ 26. However, if the Court deems that this phrase is in need of construction, Voith's construction tracks the claim language except for providing constructions for those two constituent terms: "An element which removes water from the fiber suspension or web at the start of the path through the zone where web formation occurs in a Twin Wire Former." *Id.* at ¶ 25.

JohnsonFoils' construction improperly limits "drainage element" from its literal meaning to include only "a suction roll" or a "curved stationary forming shoe." *Id.* at ¶ 25; JohnsonFoils' Opening Brief, at p. 19. First, although the specification discusses several preferred embodiments, no special meaning is given to the term "drainage element" apart from the understanding of that term to one of ordinary skill. Supplemental Waller Dec., ¶ 26. The specification's discussion of examples, such as forming cylinders and shoes, does not limit the claim. *Id.* at ¶ 27. In addition, one of ordinary skill would interpret the specification's comment

that a straight forming shoe may be used “in certain situations” as supporting the possible use of a straight forming shoe, not as disclaiming such an element. *Id.* at ¶ 28. JohnsonFoils is incorrect that the absence of any further discussion of those “certain situations” amounts to a disclaimer of straight forming shoes. *Id.* Finally, contrary to JohnsonFoils’ interpretation, the specification’s statement that “[t]o be sure, the forming roll 40 of Fig. 2 is, as a rule, developed as a suction roll” states only that in the preferred embodiment under discussion, Fig. 2, the forming roll is usually a suction roll. *Id.* at ¶ 29. The specifications’ statement about what practitioners normally use for a forming roll does not limit the term forming roll as generally used in the claims. *Id.*

JohnsonFoils’ construction also incorrectly adds the requirement that the drainage element “results in drainage from both sides of the twin wire zone.” *Id.* at ¶ 30. Although the patent specification states that drainage occurs towards both sides in the first part of the twin wire zone, ’805 Patent, Col. 5:26-30, there is no suggestion in the specification that both directions of such drainage are accomplished by a single drainage element. *Id.* In fact, one of ordinary skill in the art would interpret the language quoted by JohnsonFoils to refer to the fact that, as in Twin Wire Formers, water is drained toward both wire belts in the twin wire zone. *Id.* at ¶ 31. In addition, one of ordinary skill would interpret the specification phrase “known pre-drainage towards both sides” to refer to the unremarkable fact that one of ordinary skill knows that water is drained towards both wire belts of a Twin Wire Former, and not to a particular quantity of drainage. *Id.* at ¶ 32. In fact, the actual amount of drainage will vary depending on a number of factors including at least the speed of the wire belts, the structure of the wire belts, the composition of the fiber suspension, the headbox discharge rate, the path of the wire belts, and the drainage components used. *Id.* at ¶ 33.

JohnsonFoils' further argument that the term "drainage element" excludes drainage blades misstates the prosecution history. JohnsonFoils' Opening Brief, at p. 18. During the prosecution of claim 1 of U.S. Patent No. 5,389,206 ("the '206 patent"), Voith stated that the cited reference U.S. Patent No. 4,925,531 ("Koski") does not disclose the expressly recited "curved drainage element." Prosecution History, Exh. J to JohnsonFoils' Opening Brief. However, Voith did not, as JohnsonFoils contends, "disclaim[] drainage strips in the first section of the twin wire former." JohnsonFoils' Opening Brief, at p. 18. First, unlike the '805 patent claim term "drainage element," claim 1 of the '206 patent was expressly limited to a curved drainage element:

. . . the twin wire zone having a first section . . . having . . . a curved drainage element in the first section, the curved drainage element having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts for curving the path of the belts around the curved drainage element . . .

'206 patent, Col. 8:25-40. In the context of claim 1 of the '206 patent, Voith stated that the "deflectors" disclosed by Koski are not drainage elements, and that the "deflectors" disclosed in Koski are not a "curved drainage element." See '206 Patent Prosecution History, Exh. I to JohnsonFoils' Opening Brief. Apart from this statement taken out of context from the prosecution history of the '206 patent, the '805 patent is clear that claimed drainage strips do perform drainage. See '805 patent, Col. 6:50-59 (describing an individual strip **50** of Figure 4 located in section I and provided "solely for removal of water," i.e. drainage). In the context of the full record including the specification and the prosecution history, the statement cited by JohnsonFoils falls far short of the clear and unmistakable surrender of claim scope required to support prosecution history disclaimer. See *Pharmacia*, 170 F.3d at 1377 (to create an estoppel, disavowal of claim scope must be clear and unmistakable, not equivocal, surrender).

JohnsonFoil's further assertion that "Voith has disclaimed drainage strips in the first section of the Twin Wire Former" is plainly incorrect in view of the fact that the "first section" is an open claim limitation. *See Sandisk*, 415 F.3d at 1284 ("includes" and "comprising" are open claim terms that do not exclude unrecited elements). Because the "first section" is open, the mere presence of drainage strips in the first section—such as element 50 in Figure 4 of the '805 patent—does not take a twin wire former outside the scope of the claim.

**5. "means for supporting the belts for forming a wedge shaped entrance slot into the first section"**

<b>Claim Term</b>	<b>JohnsonFoil's Proposed Construction</b>	<b>Voith's Proposed Construction</b>
means for supporting the belts for forming a wedge shaped entrance slot into the first section	<p>Function: supporting the belts for forming a wedge shaped entrance slot into the first section</p> <p>Structure: two breast rolls or a breast roll and a suction roll that support the belts to form a wedge shaped entrance slot into the first section.</p>	<p>Function: supporting the belts for forming a wedge shaped entrance slot.</p> <p>Structure: the two rolls at the start of the twin wire former. <i>See</i> '805 patent, Figs. 1-5; col. 4:4-6.</p> <p>This limitation also includes equivalents to these structures.</p>

Voith agrees with JohnsonFoil that the "means for supporting the belts for forming a wedge shaped entrance slot into the first section" is a means-plus-function limitation. However, Voith contends that the recited function is "supporting the belts for forming a wedge shaped entrance slot." JohnsonFoil's proposed construction of "supporting the belts for forming a wedge shaped entrance slot into the first section" adds the language "into the first section" and, as such, improperly incorporates structural matter into the recited function. *See* Supplemental Waller Dec., ¶ 34. The language "into the first section" specifies the structural orientation of the claimed means. *Id.* at ¶ 35.

If a construction including JohnsonFoils' added phrase "into the first section" is adopted, Voith further disagrees with JohnsonFoils' construction as incorporating JohnsonFoils' improper construction of "first section."

Voith agrees that the structures recited by JohnsonFoils—"two breast rolls or a breast roll and a suction roll"—are disclosed in the specification for performing the recited function. However, JohnsonFoils' construction fails to include other rolls that perform this function as well as the structural equivalents required by 35 U.S.C. §112 ¶ 6. Accordingly, Voith contends that the structure corresponding to the recited function is "the two rolls at the start of the twin wire former." Supplemental Waller Dec., ¶ 34.

**6. "a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot"**

Claim Term	JohnsonFoils' Proposed Construction	Voith's Proposed Construction
a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot	a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension only at the place where the lower wire in the first section of the twin wire zone travels over the stationary curved forming shoe or suction roll and forms a wedge shaped entrance	a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot

Voith contends that, apart from the terms of art "headbox" and "wedge shaped entrance slot," this phrase does not require construction because all of the other words in this phrase would be understood by one of ordinary skill to have their ordinary English meaning. See Supplemental Waller Dec., ¶ 36. A headbox is "[a] container at the beginning of the twin wire former which discharges the fiber suspension onto the wires." Voith Opening Brief, at p. 23.

The “wedge shaped entrance slot” is “[t]he wedge shaped entrance slot is the wedge-shaped area between the two wires at the start of the twin wire zone where the two wires approach each other.” *Id.* at p. 23. Assuming that these two terms of art are construed as proposed by Voith, this claim phrase needs no further construction. *See* Supplemental Waller Dec., ¶ 36.

JohnsonFoils’ construction deviates from the plain meaning of the phrase by introducing the extraneous limitation: “only at the place where the lower wire in the first section of the twin wire zone travels over the stationary curved forming shoe or suction roll and forms a wedge shaped entrance.” *Id.* at ¶ 37. JohnsonFoils’ improperly culls this limitation from a point in the specification that is clearly dedicated to describing preferred embodiments that illustrate, but do not limit, the claims:

The jet pulp discharged by the headbox 10 comes into contact with the two wire belts ii and 12 only at the place where the lower wire ii in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16.

Col. 4:6-10. *See* Supplemental Waller Dec., ¶ 38. JohnsonFoils erroneously asserts that this excerpt gave “special meaning” to the claim term at issue, but omitted that this passage occurs in the section entitled “Detailed Description of the Preferred Embodiments” in the context of a discussion of the specific “twin-wire former shown in Fig. 1.” *See* ’805 patent, col. 3:63-67; Supplemental Waller Dec., ¶ 39; *see Phillips*, 415 F.3d at 1323 (claims are not confined to preferred embodiments). Also, JohnsonFoils’ reliance on its definition of “single wire predrainage zone” is unavailing because, as explained above, that definition is contrary to the understanding of one of ordinary skill. *See* Supplemental Waller Dec., ¶ 40. Apart from that, there is no reason to modify the *meaning* of this claim phrase based on other limitations in the claim. *Id.* at ¶ 41.

7. “the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone”

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone	the twin wire zone having a second section coming after the first section in sequence and occupying a discrete physical place along the path of the belts through the twin wire zone, wherein the components of the second section are not located in any other section.	The <u>zone where web formation occurs in a twin wire former</u> having a second section following the first section along the path of the belts

Voith contends that, apart from the term “twin wire zone,” the phrase “the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone” does not require construction because one of ordinary skill would understand the other words in this phrase to have their plain and ordinary English meaning. *See* Supplemental Waller Dec., ¶ 42. If the Court deems that this phrase as a whole should be construed, and further assuming that the term “web” has been construed as proposed by Voith, Voith would construe this phrase to incorporate its construction of “twin wire zone” as “the zone where web formation occurs in a twin wire former having a second section following the first section along the path of the belts.” *Id.* at ¶ 43; Voith Opening Brief, at p. 22.

As with its construction of “first section,” JohnsonFoils construction of this claim phrase to include “wherein the components of the second section are not located in any other section” improperly excludes unrecited components from *open* limitations. *See Sandisk*, 415 F.3d at 1284 (“includes” and “comprising” are open claim terms); Supplemental Waller Dec., ¶ 44. Consistent with the specification, the claims require several recited components, including drainage strips, to be in the web forming section following the first section. *Id.* However, the

positive recitation that particular drainage strips, or other components, are in the second section does not bar the use of other such strips or components in other sections. *Id.* at ¶ 45. The specification extracts cited by JohnsonFoils are not to the contrary. *Id.* Specifically referring to “the alternately resiliently and firmly supported ledge strips 27 and 28” in a preferred embodiment, the specification states that these strips “lie not in the front or the rear sections but in the middle of section II of the twin-wire zone, since only here can they develop their full effect.” *Id.* at ¶ 46; ’805 patent, Col. 5:15-30. Apart from being a description of a preferred embodiment, not a definition of claim language, this description says nothing about excluding drainage strips from other sections and only specifies the preferred positioning of specifically recited strips. Supplemental Waller Dec., ¶ 46. Indeed, the specification expressly discloses the deployment of a drainage strips in section one. *See* ’805 Patent, Fig. 4, element 50. *Id.* at ¶ 47. As described in the specification, the individual strip 50 is used to accomplish *predrainage* by removing water and for producing turbulence in the suspension. *See* ’805 patent, Col. 6:50-66; Supplemental Waller Dec., ¶ 48.

Apart from incorrectly excluding elements found in the second section from other parts of the twin wire zone, JohnsonFoils’ construction also confusingly adds the concept from its construction of “following”: “occupying a discrete physical space.” *See* Supplemental Waller Dec., ¶ 49. This construction is misleading because it suggests that the second section occupies a space which is separated by some means from the first section. *Id.* This concept is not only unnecessary, but no such separating structure is disclosed or described in the specification. One of ordinary skill would understand the term “following” to have its ordinary English meaning of “coming after.” *Id.*

8. “a plurality of first drainage strips are positioned for contacting the first wire belt”

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
a plurality of first drainage strips are positioned for contacting the first wire belt	a plurality of first drainage strips that are not forming shoe strips, are not feed or discharge edges of drainage boxes, and are positioned for contacting the first wire belt.	A plurality of first drainage strips are positioned for contacting the first wire belt

Voith contends that apart from the terms of art “wire” and “drainage strips,” there is no need to further construe this phrase since the other words would be understood by one of ordinary skill to have their plain and ordinary English meaning. Accordingly, Voith’s construction, assuming that the meaning of those technical terms of art are construed as proposed by Voith, tracks the original claim language.

JohnsonFoils’ construction improperly limits the general meaning of these claim terms to exclude “forming shoe strips” and “feed or discharge edges of drainage boxes.” *Id.* at ¶ 50. JohnsonFoils’ citation of the specification to support its proposed construction is misplaced. *See* JohnsonFoils’ Opening Brief, at p. 22-23. In describing a preferred embodiment, the passage cited by JohnsonFoils states that “[i]nstead of a rigidly supported strip, a feed or discharge end of a drainage box can also be provided,” ’805 Patent, Col 7:65-67. One of ordinary skill would understand that this passage is enumerating structural substitutes for rigidly mounted strips. Supplemental Waller Dec., ¶ 51. On its face, this positive recitation of possible substitutes for rigidly mounted strips does not appear to constrain the “first drainage strips” in any way. *Id.* at ¶ 52. The cited passage surely fails to justify adopting a meaning for “a plurality of first drainage

strips are positioned for contacting the first wire belt” different from its plain and ordinary meaning. *Id.* at ¶ 53.

9. “a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt”

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt	a plurality of second drainage strip that are not forming shoe strips positioned within the loop of the second wire belt for contacting the second wire belt	A plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt

Voith contends that apart from the term of art “wire belt” this claim phrase requires no further construction because the other words in the phrase would be understood by one of ordinary skill to have their plain and ordinary English meaning. Supplemental Waller Dec., ¶ 54. JohnsonFoils’ proposed construction not only deviates from this plain meaning but also improperly adds—without any explanation—a limitation nowhere found in the claim: “[The second drainage strips] are not forming shoe strips.” See JohnsonFoils’ Opening Brief at p. 23-24; Supplemental Waller Dec., ¶ 55.

10. “the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship”

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship	each of the first strips and the second strips lies in the region that is spaced between two of the opposite strips	Positioned so that the contact points of the blades on the wire do not oppose one another, <i>e.g.</i> , positioned in a zig-zag or staggered array. <i>See, e.g.</i> , ‘805 patent, col. 2:63-66.

Voith contends that the only part of this phrase requiring construction is “offset and in a non-opposing relationship” because, apart from this phrase, the other words would be understood by one of ordinary skill to have their plain and ordinary English meaning. Voith construes this phrase as “positioned so that the contact points of the blades on the wire do not oppose one another, *e.g.*, positioned in a zig-zag or staggered array.” *See, e.g.*, ‘805 patent, col. 2:63-66; Waller Dec., ¶ 82 (D.I. 66); Voith’s Opening Brief, at p. 24. Rather than explain this claim phrase, JohnsonFoils’ proposed construction lifts language from a part of the specification which describes an embodiment, but does not purport to define claim terms. Supplemental Waller Dec., ¶ 56. In addition, the language chosen by JohnsonFoils is potentially misleading because it suggests that every blade must have two opposing blades on either side: a condition which is actually inconsistent with every disclosed embodiment. *Id.* at ¶ 57. Specifically, in every disclosed embodiment the strips at the end on at least one side have only one opposing blade. *Id.* at ¶ 58. This potentially confusing imprecision in the specification incorporated in JohnsonFoils’ proposed construction has no bearing on claim construction and should be rejected.

In addition, JohnsonFoils is incorrect that Voith waived "equivalents of the recited strip arrangement." During prosecution of United States Patent No. 5,389,206 ("the '206 patent") Voith distinguished U. S. Patent No. 4,769,111 (the '111 patent) because the '111 patent did not show the displacement of strips claimed in the patent:

4. Patent documents 4, 5 and 6 have been cited to show flexibly supported battens in a twin wire former. The battens, however, are not displaced as set forth in applicants' invention. Additionally, the twin wire formers of documents 4, 5 and 6 are hybrid twin wire formers having respective single wire dewatering sections upstream of the twin wire zone.

See JohnsonFoils' Opening Brief, Exhibit K, at p. 3. At most, this statement amounts to an argument based disclaimer of claim scope that would include the opposing strip arrangement of the '111 patent. However, because the '111 patent discloses blades that are directly opposite one another, such a disclaimer would have no effect on claim construction because the claim itself literally requires a non-opposing strip arrangement. See '111 patent, Fig. 2, Exh. L to JohnsonFoils' Opening Brief.

11. “first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact”

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact	<p>Function: resiliently supporting the first drainage strips against the respective wire belt that the strips contact</p> <p>Structure: springs, pneumatic pressure cushions, or a water permeable plate that are associated with the first drainage strips and resiliently support them against the respective wire belt. JohnsonFoils’ Opening Brief, at p. 24.</p>	<p>The “support means for resiliently supporting” is a means-plus-function limitation. The recited function is “resiliently supporting.” Exemplary structures disclosed in the specification for resiliently supporting the blades are springs and pneumatic pressure cushions. <i>See, e.g.</i>, ‘805 patent, col. 4:19-26. This limitation includes these disclosed structures and equivalents thereof. 35 U.S.C. § 112 ¶ 6.</p>

The parties agree that this phrase includes a means-plus-function limitation, but each party identifies a different phrase corresponding to that limitation. Voith contends that the means-plus-function limitation is “means for resiliently supporting.” Voith’s Opening Brief, at p. 24. Voith further contends that the recited function is “resiliently supporting.” *Id.* The structures disclosed in the specification linked to this function are springs and pneumatic pressure cushions. *Id.*

JohnsonFoils construction is incorrect because it adds claim words which recite additional structural limitations on the means-plus-function element. *See* Supplemental Waller Dec., ¶ 59. That this is the “first” such means is not necessary to understanding either the recited function or the corresponding structure. *Id.* In addition, the claim language “the first drainage strips against the respective wire belt that the strips contact” provides a structural positioning of the claimed means and its intended purpose, but does not further elucidate the *function*. *Id.* at ¶

60. For these reasons, Voith contends that the proper means-plus-function limitation is “means for resiliently supporting” construed as proposed by Voith. *Id.* at ¶ 61.

JohnsonFoil’s construction is also incorrect because it incorrectly identifies a “water permeable plate” as a resiliently supporting structure. *Id.* at ¶ 62. In the passage cited by JohnsonFoil, the specification states the following:

In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

’805 Patent, Col. 4:24-28 (emphasis added); *see* Supplemental Waller Dec., ¶ 62. The specification clearly states that the resilient springs and pressure cushions are preferably *on* a water permeable plate. *Id.* at ¶ 63; ’805 Patent, Col. 4:24-28. There is no suggestion in the specification that a water permeable plate, itself, is structure corresponding to the “resiliently supporting” function. *See* Supplemental Waller Dec., ¶ 63.

**12. “second support means supporting the second drainage strips rigidly against the second wire belt”**

Claim Term	JohnsonFoil’s Proposed Construction	Voith’s Proposed Construction
Second support means supporting the second drainage strips rigidly against the second wire belt	An indefinite structure for supporting the second drainage strips rigidly against the second wire belt.	Function: supporting the drainage strips rigidly  Structure: Guide plates, drainage boxes, vacuum chambers, and equivalents. <i>See</i> ’805 patent, Col. 6:25-28 (guide plates); Col. 7:4-11 (vacuum chambers); Col. 4:29-36 (drainage box).

The parties agree that this claim phrase contains a means-plus-function element. Voith contends that the means-plus-function element is “means for supporting the drainage strips rigidly.” One of ordinary skill would understand that the recited function of this means-plus-

function element is “supporting the drainage strips rigidly.” Supplemental Waller Dec., ¶ 64. The structure disclosed in the specification for rigidly supporting drainage strips include guide plates, vacuum chambers, and drainage boxes. *See* ’805 patent, Col. 6:25-28 (guide plates); Col. 7:1-11 (vacuum chambers); Col. 4:29-36 (drainage box); *see* Supplemental Waller Dec., ¶ 65. As explained in the specification, “guide plates” are “associated with the fixed strips.” ’805 patent, Col. 6:25-28. One of ordinary skill would understand that these guide plates provide rigid mounting structure for the fixed strips. *See* Supplemental Waller Dec., ¶ 66. In the embodiment described by Figure 1, the specification explains that “a row of at least three strips 28 . . . are rigidly attached to the box 18.” ’805 patent, Col. 4:29-36; Supplemental Waller Dec., ¶ 67. One of ordinary skill would understand that the drainage box is the rigid mounting structure for the blades. *Id.* at ¶ 68. In the embodiments described by Figure 4 and Figure 5, the “vacuum chamber” structures 51 and 56 are described as “supporting bodies” for the rigidly mounted strips. ’805 patent, Col. 7:4-11; Supplemental Waller Dec., ¶ 69.

JohnsonFoil’s construction first errs by incorporating an unnecessary phrase “against the wire belt” which relate to the particular purpose of the means-plus function-element, not its meaning. Supplemental Waller Dec., ¶ 70. JohnsonFoil also errs by including the unnecessary word “second support” since this language is unrelated to the claimed function and merely states that the structure corresponding to this means-plus-function element is in addition to structure associated with some other support. *Id.* at ¶ 71. The existence of another, different, support does not change the meaning of the means for supporting the drainage strips rigidly. *Id.* at ¶ 72. JohnsonFoil’s assertion that there is no disclosed structure for rigidly supporting the drainage strips is based solely on JohnsonFoil’s inclusion of extraneous words in the means-plus-function

element and its resulting inability to find those very words in the specification in passages describing the structures that rigidly support blades. *Id.* at ¶ 73.

**13. “first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips”**

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips	a vacuum chamber, in a drainage box, that collects water drained by the most upstream one of the drainage strips through a vertical channel	<p>The “means for collecting the water” is a means-plus-function limitation.</p> <p>The recited function is “collecting water.” The structures disclosed in the specification for collecting water include water-collection containers and channels.</p> <p>This limitation includes these disclosed structures and equivalents thereof. 35 U.S.C. § 112 ¶ 6.</p>

The parties agree that this claim language contains a means-plus-function element. The parties differ in identifying that element. Voith contends that the means-plus-function element is “means for collecting water.” The recited function is “collecting water.” The structure disclosed in the specification for collecting water includes various water collection chambers and channels. *See, e.g.*, ’805 patent, col. 6:25-26 (“Further elements of the twin-wire former shown in Fig. 2 are water-collection containers 41, 42 and 43.”); ’805 patent col. 4:44-47 (“Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28”). Supplemental Waller Dec., ¶ 74. Therefore, water collection chambers, water collection channels, and their equivalents, are within the scope of this limitation. *See id.* at ¶ 75; *see* 35 U.S.C. § 112 ¶6.

JohnsonFoils’ proposed construction incorrectly identifies the means-plus-function limitation by adding claim terms, “drained from the fiber suspension by the most upstream one of the drainage strips,” relating to the source of the water collected by the means for collecting

water. *Id.* at ¶ 76. These words qualify the use of the claimed means in the claimed invention, but are not needed to understand the means-plus-function limitation itself. *Id.* After adding these extraneous terms to the recited function “collecting water,” JohnsonFoils further errs by limiting the means for collecting water to a “vacuum chamber in a drainage box.” The specification clearly discloses that channels also collect water. ’805 patent col. 4:44-47; Supplemental Waller Dec., ¶ 76.

JohnsonFoils’ citation to the prosecution history does not justify imposing any additional limits on the interpretation of “means for collecting water.” The prosecution history excerpts cited by JohnsonFoils concern a clarification of the source of the water being collected, not the “means for collecting water.” See ’805 patent, Prosecution History excerpts, Exh. G, H to JohnsonFoils’ Opening Brief. During prosecution, the Examiner asserted that claim 1 of the ’805 patent was unclear because it did not state whether water from a first or second strip was being collected. See ’805 patent, Prosecution History excerpts, Exh. G to JohnsonFoils’ Opening Brief, at p. 2. Voith—retaining its original claim language and rejecting the Examiner’s proposed amendment—explained that there was no ambiguity because, in fact, the water could be collected from either a first strip or second strip, depending on whether a first strip or second strip was the most upstream strip on the belt. See ’805 patent, Prosecution History excerpts, Exh. H to JohnsonFoils’ Opening Brief, at p. 9. Voith explained the Examiner’s error and said nothing that would limit the interpretation of the means-plus-function element “means for collecting water.” See *Pharmacia*, 170 F.3d at 1377 (to create an estoppel, disavowal of claim scope must be clear and unmistakable, not equivocal, surrender).

14. “second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips”

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
Second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips	an indefinite structure, separate from the vacuum chamber, the drainage box and the vertical channel, for collecting the water drained from the fiber suspension by all of the remaining first and second strips	<p>The “means for collecting the water” is a means-plus-function limitation.</p> <p>The recited function is “collecting water.” The structures disclosed in the specification for collecting water include water-collection containers and channels.</p> <p>This limitation includes these disclosed structures and equivalents thereof. 35 U.S.C. § 112 ¶ 6.</p>
		<p>water collecting structure, such as containers or channels, different from the water collecting structure used to collect water from the most upstream strip, that collects the water drained from the other strips.</p>

The parties agree that this claim phrase contains a means-plus-function limitation, but disagree on their identification of that limitation. Voith contends that the means-plus-function limitation is “means for collecting water” as construed previously. *See, supra*, ¶ 13. Voith contends that the additional language in this phrase is not in need of construction since one of ordinary skill would recognize that the words have their plain and ordinary English meaning. *See* Supplemental Waller Dec., ¶ 77. However, if this Court deems that the entire phrase should be construed, Voith contends that the entire phrase means “water collecting structure, such as containers or channels, different from the water collecting structure used to collect water from the most upstream strip, that collects the water drained from the other strips.” *Id.* at ¶ 78.

JohnsonFoils’ failure to identify the water containing structure disclosed in the specification directly results from its inclusion of extraneous terms “drained from the fiber

suspension by all of the other drainage strips” in its misidentification of the recited function of the means-plus-function limitation. The terms added to the recited function by JohnsonFoils’ construction specify only the source of the water collected and have nothing to do with water collection itself. *Id.* at ¶ 79.

**15. “the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone”**

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone	A third section coming after the second section in sequence and occupying a discrete physical place along the path of the wire belts, wherein no component of the third section is located in any other section	the <u>zone where web formation occurs in a twin wire former</u> having a third section following the first section along the path of the mesh belts

Voith contends that, apart from construing the terms of art “twin wire zone” and “wire belts,” this term does not require construction because one of ordinary skill would interpret this term to have its plain and ordinary meaning: The zone where web formation occurs in a twin wire former having a third section following the second section along the path of the mesh belts. Supplemental Waller Dec., ¶ 80.

JohnsonFoils’ construction of this claim language is misleading because it implies that the Third Section is limited to the components expressly enumerated in the claim. Supplemental Waller Dec., ¶ 81. This is incorrect because the claimed Twin Wire Former *comprises*, and is not limited to, the enumerated elements. *Id.* In addition, the third section of the claimed Twin Wire Former *includes* the enumerated components, but—contrary to JohnsonFoils’

construction—does not *exclude* other components. *Id.* Both the claimed Twin Wire Former and its “third section” are *open*. *Id.* See *Sandisk*, 415 F.3d at 1284 (“includes” and “comprising” are open claim terms). As such, recitations of components included in a section do not *exclude* other components. *Id.*

Apart from incorrectly excluding elements found in the third section from other parts of the twin wire zone, JohnsonFoils’ construction also confusingly adds the concept from its construction of “following”: “occupying a discrete physical space.” This construction is misleading because it suggests that the third section occupies a space which is separated by some means from the first section. This concept is not only unnecessary, but no such separating structure is disclosed or described in the specification. One of ordinary skill would understand the term “following” to have its ordinary English meaning of “coming after.” Supplemental Waller Decl., ¶ 82.

16. “a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element”

Claim Term	JohnsonFoils’ Proposed Construction	Voith’s Proposed Construction
a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element	a curved forming shoe positioned in the third section so one of the wire belts travels over the curved forming shoe	a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element

Voith contends that, apart from the terms of art “wire belts” and “drainage element,” this claim language does not require construction because its terms would otherwise be understood by one of ordinary skill to have their plain and ordinary English meaning. See Supplemental Waller Dec., ¶ 83. If this phrase is construed, assuming that Voith’s proposed definitions of

these terms of art are provided, Voith would construe this phrase to track the claim language: “a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element.” *Id.* at ¶ 84.

Without any explanation, JohnsonFoils’ construction incorrectly limits the “second drainage element” to a “curved forming shoe.” JohnsonFoils’ Opening Brief, at p. 29. The specification passage cited by JohnsonFoils occurs in the context of a discussion of the preferred embodiment shown in Figure one and clearly states that it is describing a preferred embodiment, not defining the term “second drainage element”:

In the third section III of the twin-wire zone, both wire belts **11** and **12** travel over another *preferably curved forming shoe 23* which (as shown) is arranged preferably in the lower wire loop 11.

’805 patent, Col. 5:2-4 (emphasis supplied). Supplemental Waller Dec., ¶ 85. But the specification elsewhere discusses other drainage elements, including straight forming shoes, drainage strips, and flat suction boxes. *See, e.g.*, ’805 patent, Col 4:14-16 (straight forming shoe); Col. 6:58-59 (drainage strip); Col. 6:1-2 (flat suction boxes). Supplemental Waller Dec., ¶ 86. JohnsonFoils’ proposed construction impermissibly imports this discussion of a preferred embodiment into the claim. *Id.* at ¶ 87; *see Phillips*, 415 F.3d at 1323 (Federal Circuit has repeatedly warned against confining claims to preferred embodiments).

**17. “the twin wire zone being free of rolls which deflect the twin wire zone”**

<b>Claim Term</b>	<b>JohnsonFoils’ Proposed Construction</b>	<b>Voith’s Proposed Construction</b>
the twin wire zone being free of rolls which deflect the twin wire zone	the entire twin wire zone must be free of any deflection rolls	the twin wire zone being free of rolls which deflect the twin wire zone

Voith contends that, apart from the technical terms of art “twin wire zone” this claim language requires no further construction because one of ordinary skill would understand the other terms in this phrase to have their plain and ordinary English meaning. *See* Supplemental Waller Dec., ¶ 88.

JohnsonFoils’ construction is incorrect because, without identifying any basis in the specification or prosecution history, it deviates from the plain and ordinary meaning of the claim as would be understood by one of ordinary skill. There is no disclosure in the specification of a “deflection roll.” *Id.* at ¶ 89. The specification discusses various rolls, and the fact that rolls can deflect the twin wire zone. *Id.* at ¶ 90.

Also, JohnsonFoils’ addition of the word “entire” to modify “twin wire zone” is unsupported by the specification or prosecution history and does not help explain the term “twin wire zone.” *Id.* at ¶ 91. The prosecution history of the ’805 patent discloses that the claims were limited to exclude rolls from the twin wire zone in order to distinguish prior art references which disclosed rolls that were entirely within the twin wire zone. *See* United States Patent No. 4,609,435 (“Tissari”); Exh. 1; United States Patent No. 4,925,531 (“Koski”); Exh. 2. Supplemental Waller Dec., ¶ 92. Such rolls are different from the four rolls that the wire belts contact just after they exit and just before they enter the twin wire zone as disclosed in the ’805 patent. *See* ’805 patent, Figures 1-5 (disclosing embodiments, each of which contains four rolls that the wires contact just as they enter and just as they leave the twin wire zone). Supplemental Waller Dec., ¶ 93. In fact, both Koski and Tissari disclose that the rolls contained within the twin wire zone are in addition to the rolls that the wires contact just as they enter and just as they

leave the twin wire zone. *See* Koski (Figure 1), Exh. 2; Tissari (Figures 1-6), Exh. 1.<sup>1</sup>

Supplemental Waller Dec., ¶ 94.

The prosecution history of the '805 patent confirms that it was only rolls entirely within the twin wire zone that were disclaimed. During the prosecution of the '805 patent, Voith cancelled the originally filed independent claims 1 - 4 and rewrote original dependent claims 5 and 6 to incorporate the depended-from claim 1. *See* '805 patent, Prosecution History, Paper No. 8; Exh. 3. The amendment of original claim 5 resulted in a claim identical to claim 1 with the added limitation "the twin wire zone being free of rolls which deflect the twin wire zone." *Id.* The amendment of original claim 6 resulted in a claim identical to claim 1 with the added limitation "the twin wire zone being free of any forming rolls." *Id.* Supplemental Waller Dec., ¶ 97. In allowing claims 1-5 of the '805 patent, the examiner explained, in discussing claim 32 (issued claim 5), that the claim was allowable because, although it included a forming roll, "no other rolls which deflect the twin wire zone are present such as in Koski and Tissari." '805 patent, Prosecution History, Paper No. 10 (emphasis supplied); Exh. 4. Supplemental Waller Dec., ¶ 98.

Consistent with the specification and the prosecution history, Voith contends that the literal and plain meaning of the phrase "the twin wire zone being free of rolls which deflect the twin wire zone" refers to the exclusion of rolls other than the four rolls that the wire belts contact just as they enter and just as they leave the twin wire zone.

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<sup>1</sup> Although Figures 4–6 of Tissari do not expressly depict all of the rolls that the wires contact as they enter and leave the twin wire zone, they clearly show that the wires 10 and 20 are pressed together as they pass over rolls that are, consequently, clearly entirely within the twin wire zone.

**C. Construction of Claim Terms From Other Claims of the '805 Patent**

As explained above, Voith contends that, apart from the need to explain technical terms of art, one of ordinary skill would interpret the claims of the Patents-in-Suit in accordance with their plain and ordinary English meaning. To the extent that JohnsonFoils' construction of other claims of the Patents-in-suit depend on JohnsonFoils' construction of claim 1 of the '805 patent, Voith's responds as above.

**18. "the twin wire zone being free of any forming rolls" ('805 patent, Claim 2)**

<b>Claim Term</b>	<b>JohnsonFoils' Proposed Construction</b>	<b>Voith's Proposed Construction</b>
the twin wire zone being free of any forming rolls	the entire twin wire zone must be free of any forming rolls	the twin wire zone being free of any forming rolls

Voith contends that, apart from the technical terms of art "twin wire zone" and "forming roll" this claim language requires no further construction because one of ordinary skill would understand the other terms in this phrase to have their plain and ordinary English meaning. See Supplemental Waller Dec., ¶ 99. The addition of the word "entire" to modify "twin wire zone" is unsupported by the specification or prosecution history and does not help explain the term "twin wire zone." *Id.* at ¶ 100. For the same reasons discussed in detail in ¶ 17 above, the interpretation of the limitation "being free of any forming rolls" most consistent with the specification and prosecution history of the Patents-in-suit is that the forming rolls excluded from the twin wire zone by this limitation are rolls other than the four rolls which contact the twin wire belts just as they enter and just as they leave the twin wire zone. *See supra* at ¶ 17.

19. “first drainage element at the start of the path through the twin wire zone”  
('805 patent, Claim 2)

Claim Term	JohnsonFoils' Proposed Construction	Voith's Proposed Construction
a first drainage element at the start of the path through the twin wire zone	A curved stationary forming shoe within the twin wire zone that results in drainage from both sides of the twin wire zone.	An element which removes water from the fiber suspension or web at the start of the path through the zone where web formation occurs in a Twin Wire Former.

Voith contends that the claim phrase “a first drainage element at the start of the path through the twin wire zone” from claim 2 of the '805 patent should be construed the same way as the identical phrase occurring in claim 1 of the '805 patent. *See supra*, ¶ 4; Supplemental Waller Dec., ¶ 102. As explained above, apart from the technical terms “drainage element” and “twin wire zone” this phrase does not require construction. One of ordinary skill would understand the other words in this phrase to have their plain and ordinary English meaning. *Id.* at ¶ 105. However, if the Court deems that this phrase is in need of further construction, Voith's construction tracks the claim language except for providing constructions for those two constituent terms: “An element which removes water from the fiber suspension or web at the start of the path through the zone where web formation occurs in a Twin Wire Former.”

JohnsonFoils' construction is based on JohnsonFoils' incorrect construction of the identical claim term of claim 1, and is rebutted by Voith in paragraph 4 above. JohnsonFoils' further limitation of this claim phrase based on the claim 2 limitation “the twin wire zone being free of any forming rolls” is incorrect because that limitation, although limiting the scope of claim 2, does not explain the meaning of “a first drainage element at the start of the path through the twin wire zone.” Supplemental Waller Dec., ¶ 103.

**20. '805 Patent, Claim 3**

Voith contends that apart from technical terms of art explained in Voith's Opening Brief, legal terms of art such as the open terms "comprises" and "includes," and means-plus-function limitations, Claim 3 does not require further construction because one of ordinary skill would understand the other words to have their plain and ordinary English meaning. Supplemental Waller Dec., ¶ 104.

JohnsonFoils' is incorrect that the scope of claim 1 and claim 3 is the same. JohnsonFoils' Opening Brief, at p. 33. In fact, the claims have several differences, some of which JohnsonFoils expressly admits. *Id.* As admitted by JohnsonFoils, claim 3 does not recite the first or second "means for collecting water." *Id.* JohnsonFoils also admits that claim 2 has additional limitations relating to the positioning of the first and second drainage strips and the structure of the second drainage element. *Id.* JohnsonFoils dismissal of these admitted differences as "linguistic changes" is inexplicable.

**21. '805 Patent, Claim 4.**

Voith contends that apart from technical terms of art explained in Voith's Opening Brief, legal terms of art such as the open terms "comprises" and "includes," and means-plus-function limitations, Claim 4 does not require further construction because one of ordinary skill would understand the other words to have their plain and ordinary English meaning. Supplemental Waller Dec., ¶ 104. JohnsonFoils does not appear to offer any construction of this claim, referring instead to its construction of phrases from claims 1-3. JohnsonFoils' Opening Brief, at p. 33. Voith responds to JohnsonFoils' "construction" by reference to its responses to JohnsonFoils' constructions enumerated in ¶¶ 1-20 above.

**22. '805 Patent, Claim 5.**

Voith contends that apart from technical terms of art explained in Voith's Opening Brief, legal terms of art such as the open terms "comprises" and "includes," and means-plus-function limitations, Claim 5 does not require further construction because one of ordinary skill would understand the other words to have their plain and ordinary English meaning. Supplemental Waller Dec., ¶ 104. Again, JohnsonFoils does not appear to offer any construction of this claim, referring instead to its construction of phrases taken from claim 1. JohnsonFoils' Opening Brief, at p. 33. Voith responds to JohnsonFoils' "construction" by reference to its responses to JohnsonFoils' constructions enumerated in ¶¶ 1-21 above.

**C. Construction of Claim Terms From Other Claims of the '168 Patent**

Voith contends that apart from technical terms of art explained in Voith's Opening Brief, legal terms of art such as the open terms "comprises" and "includes," and means-plus-function limitations, the claims of the '168 patent do not require further construction because one of ordinary skill would understand the other words to have their plain and ordinary English meaning. Supplemental Waller Dec., ¶ 105. To the extent that JohnsonFoils' bases its proposed constructions of the claims on its construction of phrases from claim 1 of the '805 patent, Voith incorporates its responses provided in ¶¶ 1-23.

**23. '168 Patent, Claim 3**

Voith contends that apart from technical terms of art explained in Voith's Opening Brief, legal terms of art such as the open terms "comprises" and "includes," and means-plus-function limitations, claim 3 of the '168 patent does not require further construction because one of ordinary skill would understand the other words to have their plain and ordinary English

meaning. Supplemental Waller Dec., ¶ 105. One of ordinary skill would understand the other terms of claim 3 to have their plain and ordinary English meaning. *Id.*

JohnsonFoils' incorporates its construction of phrases from claim 1 of the '805 patent into its construction of this claim. For that reason, JohnsonFoils' construction of claim 3 is incorrect for the same reasons stated above in ¶¶ 1-22.

Apart from referring to its construction of claim 1 of the '805 patent, JohnsonFoils further, and incorrectly, argues that claim 3 is invalid as indefinite. First, JohnsonFoils asserts, without explanation, that it is "unclear how the first and second web forming wire belts are associated with each other or the former." JohnsonFoils' Opening Brief, at p. 36. JohnsonFoils' only purported basis for this assertion is that claim 1 of the '805 patent contained an express limitation "means for directing the wire belts to travel along a path together" which is absent in this claim. *Id.* at p. 35-36. JohnsonFoils cites no legal support—and there is none—for the extraordinary proposition that every recited limitation of every claim must be present in every other claim in order for that other claim to satisfy the requirements of 35 U.S.C. §112.

In fact, one of ordinary skill would have no difficulty in understanding the relationship that the wire belts have with each other and the former from the claim language itself:

3. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:  
first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;  
each wire belt forming an endless loop;

...

Supports which support the wire belts for forming a wedge shaped entrance slot into the first section

...

the single forming roll being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the single forming roll

...

first drainage strips . . . contacting the first wire belt

...

second drainage strips . . . contacting the second wire belt

...

drainage elements in the third section, for being engaged by one of the wire belts as the wire belts travel over the drainage elements . . .

'168 patent, claim 3, Cols. 8-9:49-37. Although a "means for directing the wire belts" is not expressly recited, one of ordinary skill would understand that some conventional means is employed so that the wire belts can "travel along a path together." Supplemental Waller Dec., ¶ 106. Examples of such conventional means are disclosed in the specification and include rolls, shoes, strips, and other structures which determine the path the belts travel. *See* Voith's Opening Brief, at p. 21-22; '805 patent, Figs. 1-5. Waller Dec., ¶ 72; Supplemental Waller Dec., ¶ 106. In fact, claim 3 expressly states that the wire belts are in contact with, engaged by, and supported with forming rolls, strips, and drainage elements. *See* Supplemental Waller Dec., ¶ 107; '168 patent, claim 3, Cols. 8-9:49-37. One of ordinary skill would understand that forming components which contact or engage the wire belt also directs the wire belt. Supplemental Waller Dec., ¶ 107.

JohnsonFoils' admits that there are numerous belt directing structure limitations recited in claim 3, but contends, without explanation, that those structural limitations must be interpreted as indefinite means-plus-function limitation. JohnsonFoils' Opening Brief, at p. 37. In doing so, JohnsonFoils provides no basis for rebutting the *presumption* that those limitations are *not* means-plus-function limitations. *See Phillips*, 415 F.3d at 1311 (the absence of the term "means" creates a rebuttable presumption that section 112, paragraph 6, does not apply); *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996) (that a claim term for a structure is defined in part by its function does not alone justify construing such terms as means-plus-function limitations). One of ordinary skill would readily understand the belt

directing structural limitations of claim 3. Supplemental Waller Dec., ¶ 107. Consequently, JohnsonFoils' purported failure to find "support in the specification" for these structural terms is irrelevant. Not only that, but the specification *does* disclose structure corresponding to these limitations. One of ordinary skill would understand that the rolls, drainage elements, and strips described in the specification contact, engage, and support the wire belts. Supplemental Waller Dec., ¶ 108.

**24. '168 Patent, claim 7.**

Voith contends that apart from technical terms of art explained in Voith's Opening Brief, legal terms of art such as the open terms "comprises" and "includes," and means-plus-function limitations, claim 7 of the '168 patent does not require further construction. One of ordinary skill would understand the other terms of claim 7 to have their plain and ordinary English meaning. *See* Supplemental Waller Dec., ¶ 109.

JohnsonFoils does not appear to provide an independent construction of this claim, instead relying on its proposed constructions for claim 1 of the '805 patent. In response, Voith hereby incorporates its constructions provided in Voith's Opening Brief, and the further arguments provided in ¶¶ 1-23, *supra*.

JohnsonFoils' conclusion that "one of ordinary skill in the art would interpret claim 7 like claim 3, or find that [the differences] further limit the scope of claim 7" is incorrect on JohnsonFoils' own characterization of the differences. *See* JohnsonFoils' Opening Brief, at p. 37-38. For example, JohnsonFoils acknowledged that claim 7 recites a "stationary curved forming shoe" in the first section, and does not recite the "single forming roll" recited in claim 3. From this example alone, it is clear that the scope of claims 3 and 7 are different, with neither claim being a further limitation of the other. Supplemental Waller Dec., ¶¶ 109-110. Twin Wire

Formers with single forming rolls, but no stationary curved forming shoe, in the first section are in the scope of claim 3, but outside the scope of claim 7. Similarly, Twin Wire Formers with stationary curved forming shoes, but no forming roll, in the first section are within the scope of claim 7, but outside the scope of claim 3. Supplemental Waller Dec., ¶ 110.

**25. '168 Patent, claims 1 and 5.**

Voith contends that apart from technical terms of art explained in Voith's Opening Brief, legal terms of art such as the open terms "comprises" and "includes," and means-plus-function limitations, claims 1 and 5 of the '168 patent do not require further construction. One of ordinary skill would understand the other terms of claims 1 and 5 to have their plain and ordinary English meaning. Supplemental Waller Dec., ¶ 105.

JohnsonFoils' does not appear to offer any construction of these method claims, instead arguing that each should be limited to one of the apparatus claims 3 and 7. As an initial matter, JohnsonFoils is incorrect that method claims are properly limited to a separately claimed apparatus. Apart from this glaring error, JohnsonFoils also surprisingly contends that the absence of a recited first, second, and third sections—terms central to JohnsonFoils' other apparatus claim constructions—is unimportant. JohnsonFoils' Opening Brief, at p. 38.

**26. '168 Patent, dependent claims 2, 4, 6, and 8.**

Voith contends that, apart from technical terms of art explained in Voith's Opening Brief, legal terms of art such as the open terms "comprises" and "includes," and means-plus-function limitations, claims 2, 4, 6, and 8 of the '168 patent do not require further construction. One of ordinary skill would understand the other terms of these claims to have their plain and ordinary English meaning. Supplemental Waller Dec., ¶ 105.

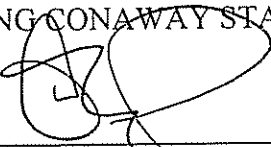
JohnsonFoils' states that "one of ordinary skill in the art would understand the plain and ordinary meaning of dependent claims 2, 4, 6, and 8." Given that these dependent claims

incorporate the limitations of the independent claims of the '168 patent—claims which JohnsonFoils has urged should be treated no differently from the claims of the '805 patent—JohnsonFoils' contention that these claims are intelligible on their face contradicts JohnsonFoils' repeated assertions that the claims are invalid and indefinite, or otherwise in need of JohnsonFoils' contrived constructions.

## II. CONCLUSION

For the foregoing reasons, together with the reasons set forth in Voith's Opening Brief, Voith respectfully requests that the Patents-in-suit be construed in accordance with Voith's proposed constructions.

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# Exhibit 1

**United States Patent** [19]

Tissari

[11] Patent Number: **4,609,435**[45] Date of Patent: **Sep. 2, 1986**[54] **PROCESS AND EQUIPMENT IN THE FORMING OF PAPER WEB**[75] Inventor: **Martti Tissari, Jyväskylä, Finland**[73] Assignee: **Valmet Oy, Finland**[21] Appl. No.: **693,170**[22] Filed: **Jan. 22, 1985**[30] **Foreign Application Priority Data**

Jan. 20, 1984 [FI] Finland ..... 840246

[51] Int. Cl.<sup>4</sup> ..... **D21F 1/00**[52] U.S. Cl. .... **162/203; 162/211; 162/301; 162/352**[58] Field of Search ..... **162/203, 205, 208, 211, 162/300, 301, 303, 348, 352**[56] **References Cited****U.S. PATENT DOCUMENTS**

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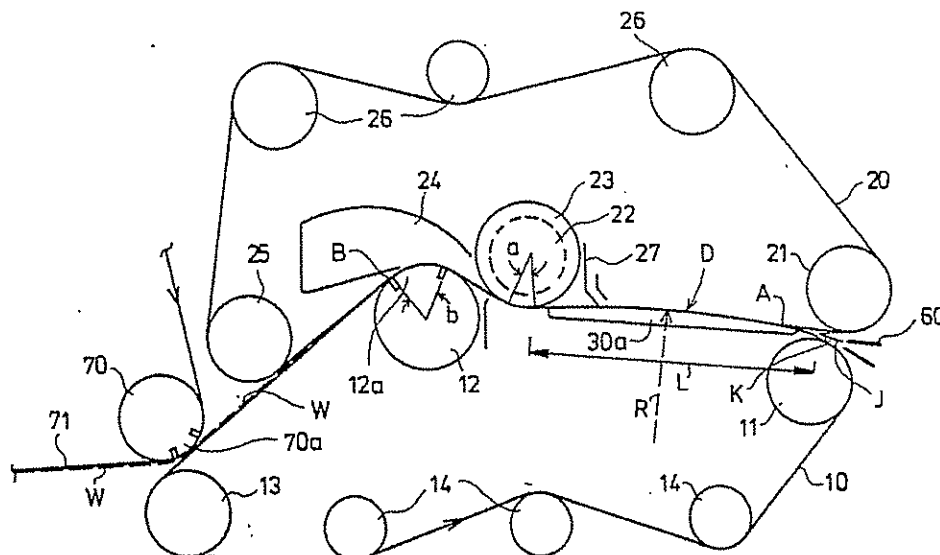
1336713 11/1973 United Kingdom ..... 162/301

Primary Examiner—S. Leon Bashore  
 Assistant Examiner—K. M. Hastings  
 Attorney, Agent, or Firm—Steinberg & Raskin

[57] **ABSTRACT**

A process in the forming of a paper web, the dewatering of the pulp web, and of the paper web being formed comprises feeding the pulp suspension jet from the slice of the headbox into a gap formed by two wires, the gap becoming narrower in the feeding direction of the pump suspension jet. Water is removed from the pulp web when the web is in compression between the carrying wire and the covering wire within the twin-wire forming zone, which begins immediately after the feeding gap. The twin-wire forming zone is curved towards the loop of the carrying wire with a curve radius which is selected large enough so that the wire tensioning pressure resulting from it and acting upon the pulp web becomes low and the water removed from the pulp web is not splashed from the inside surface of the wire loop by the effect of centrifugal force dependent upon the curve radius. The joint run of the wires is passed over an open-surfaced forming roller, so as to be curved within a relatively small angle towards the loop of the covering wire. The joint run of the wires is passed over a forming roller, so as to be curved towards the loop of the carrying wire. The formed web is detached from the wire and transferred into the press section of the paper machine. A specifically structured twin wire former carries out the process.

12 Claims, 14 Drawing Figures



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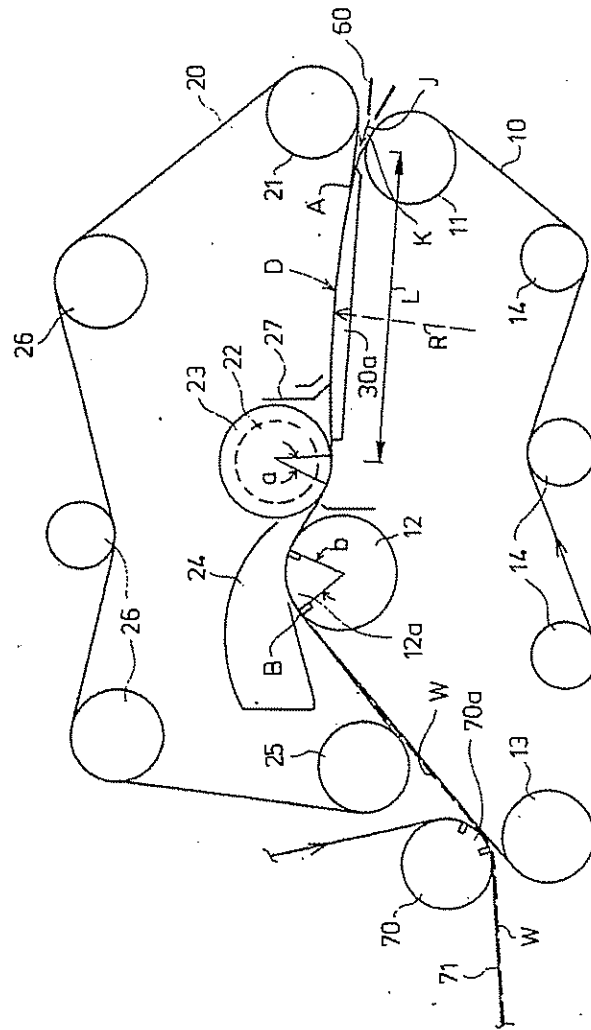


FIG. 1

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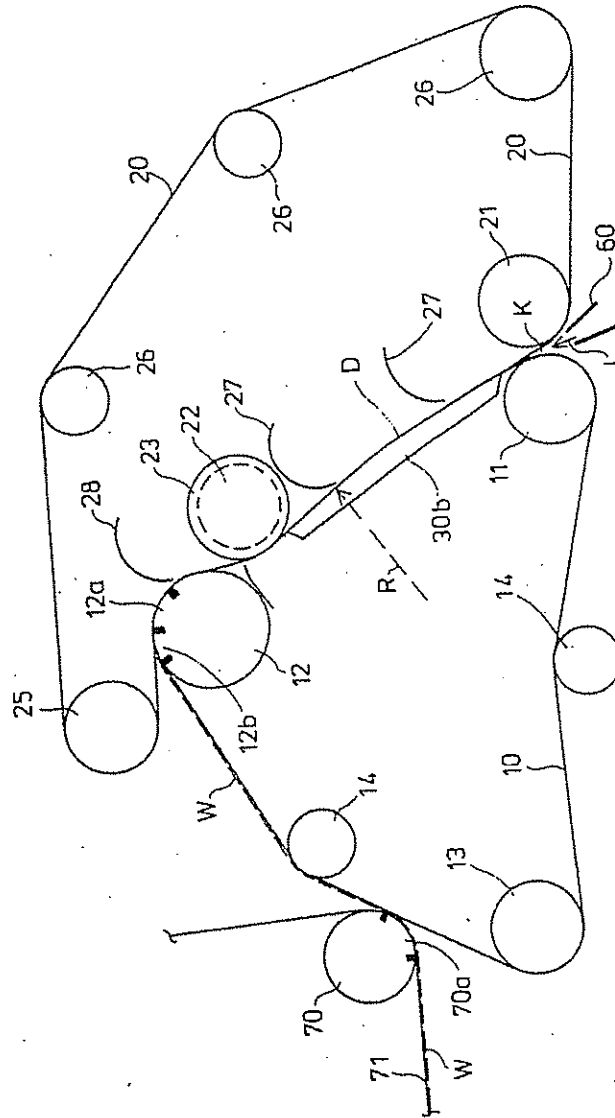


FIG. 2

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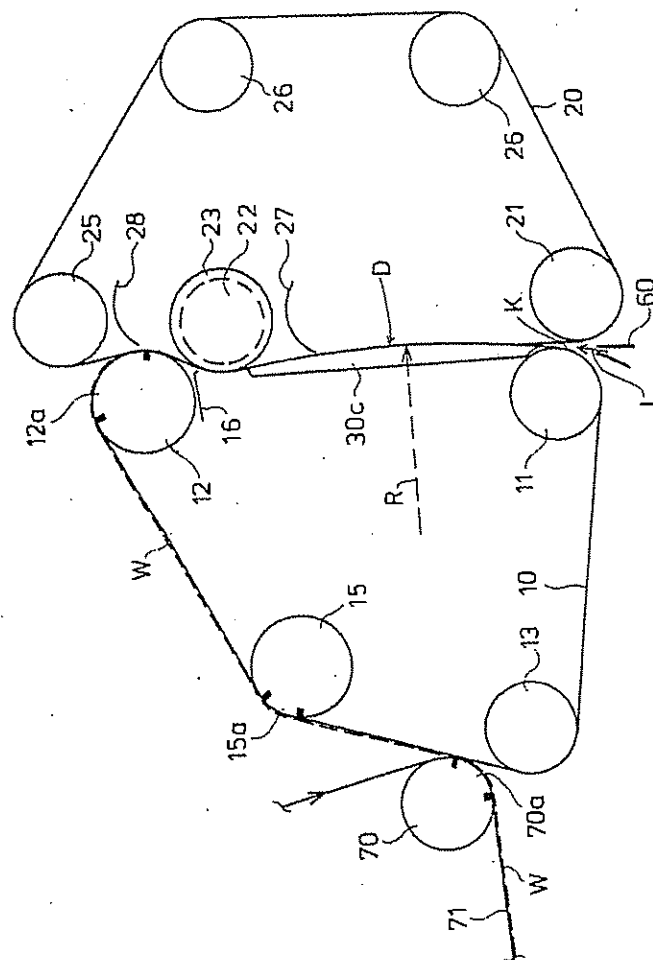


FIG. 3

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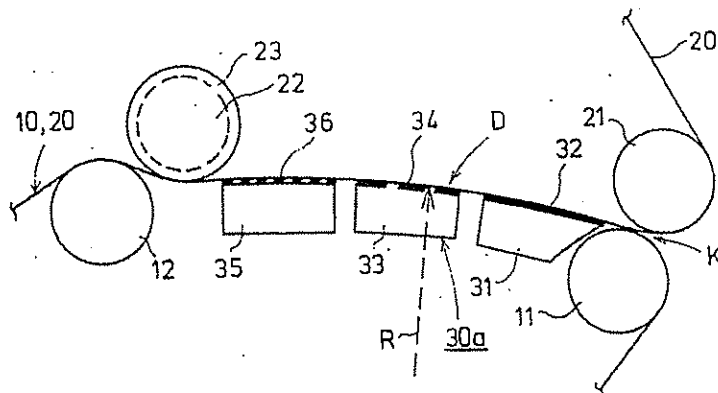


FIG. 4

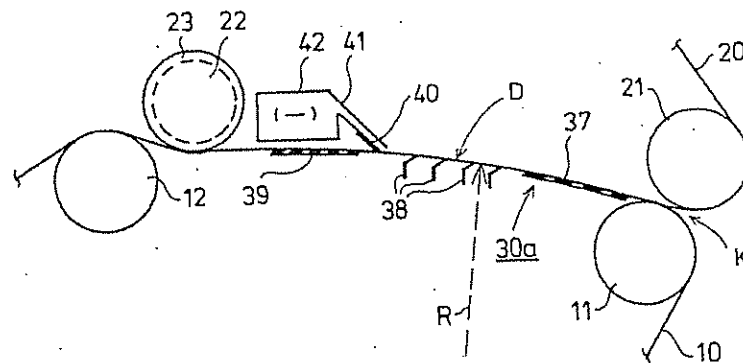


FIG. 5

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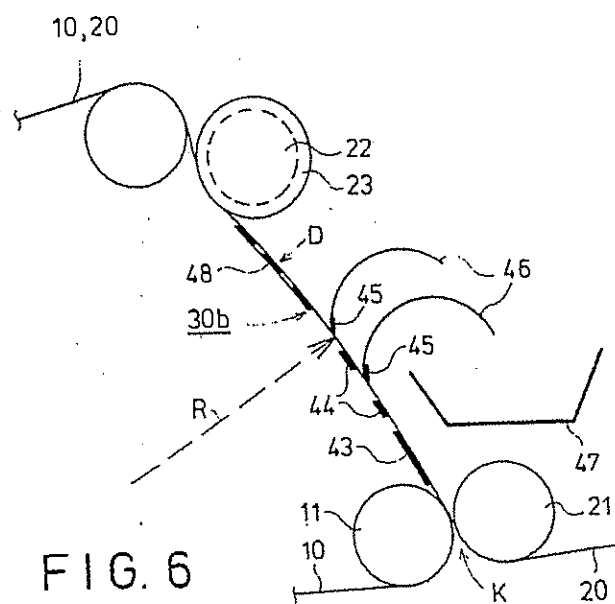


FIG. 6

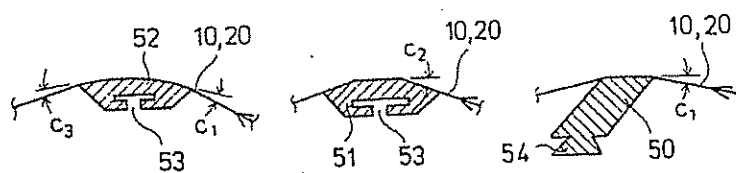
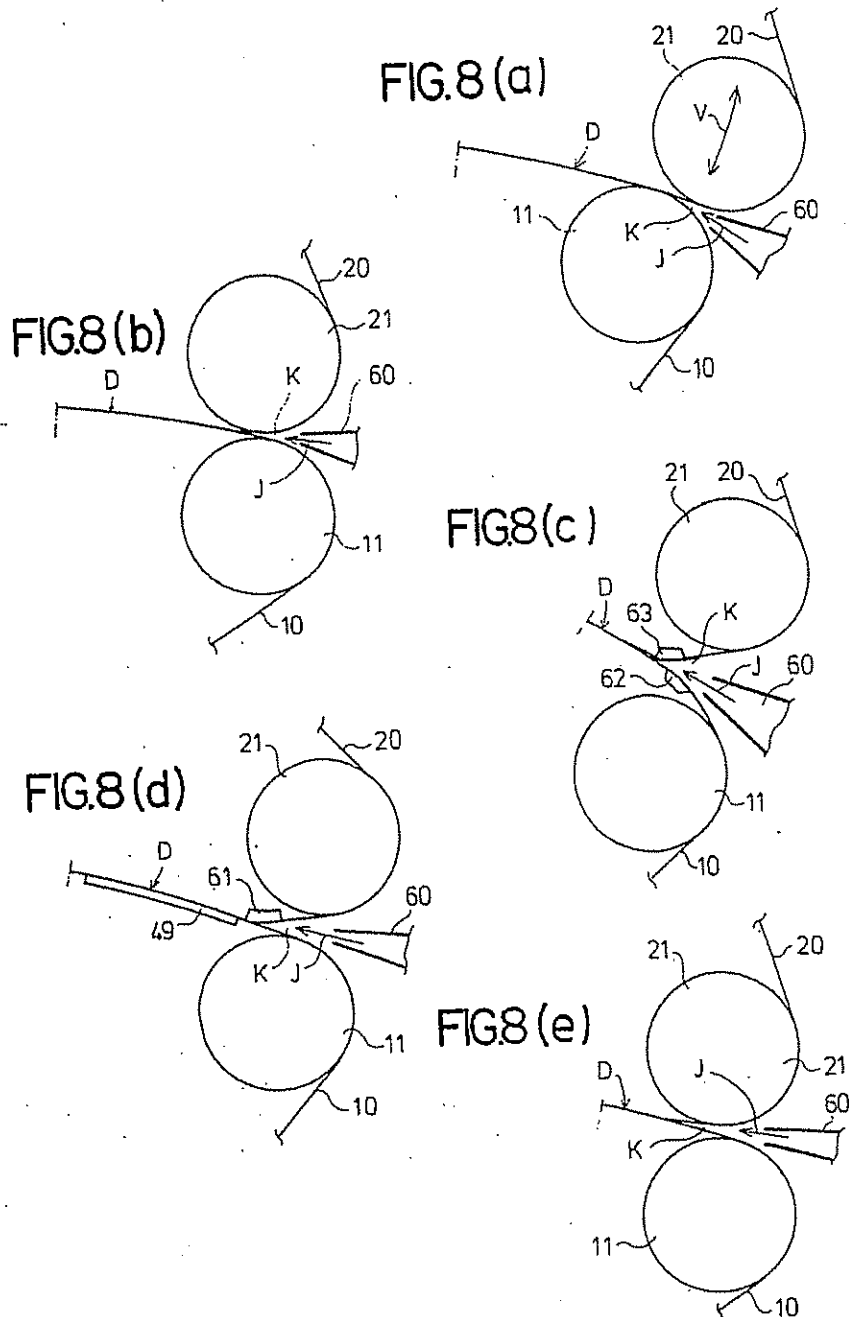


FIG. 7(a) FIG. 7(b) FIG. 7 (c)

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## PROCESS AND EQUIPMENT IN THE FORMING OF PAPER WEB

### BACKGROUND OF THE INVENTION

The present invention relates to a process and equipment used in the forming of a paper web. More particularly, the invention relates to a process in the forming of paper web and in the dewatering of the pulp web and of the paper web formed.

The invention further relates to a twin wire former intended for carrying out the process of the invention. The former comprises a loop of a carrying wire guided by the breast roller, the forming roller and the guide rollers, as well as a loop of a covering wire guided by the breast roller, the forming roller and the guide rollers. The wire loops together form a forming gap between and in connection with the breast rollers. The pulp suspension jet is supposed to be fed into the forming gap. The forming gap is followed by a joint twin-wire forming and dewatering zone of the wires. The web is arranged after the zone, so as to follow along with the carrying wire, from which the web is detached and passed into the drying section of the paper machine.

As the running speeds of paper machines are increased, several problems in the forming of the web are accentuated even further. Phenomena that act in the forming section of a paper machine upon the fiber mesh and upon the water that is still relatively free in connection with said mesh, in particular the force effects, are usually intensified in proportion to the second power of the web speed. The maximum web speeds of the present newsprint machines are of the order of 1200 meters per minute. Newsprint machines are, however, being planned in which a web speed of up to about 1500 m/min is aimed at. Such increase in speed causes several problems, which will be discussed in the following.

A so-called hybrid former is a former in which the forming zone has a single-wire initial portion, onto which the headbox feeds the pulp suspension jet. A twin wire forming zone follows the single-wire portion. A problem of hybrid formers, as of four-drinier formers, is that at high web speeds splashes occur in the pulp web. These splashes result from the collision angle between the pulp jet and the forming board and, on the other hand, from the scattering of the highly turbulent pulp jet as said jet meets the forming board. The reach of the splashes in the direction of the pulp web is quite long, and these splashes cause marks in the pulp web being formed and thereby deteriorates the quality of the paper produced. On the other hand, the foil pulses used for the removal of water from a fourdrinier former become so high at high speeds that this causes splashing which deteriorates the formation of the web. As is well known, the foil pulsation increases proportionally to the second power of the speed. In order that the pulsation be maintained below the splashing limit at a high speed, the foil angles must be made so small (approaching the angle 0°) that an adequate dewatering capacity is not obtained.

It is a further drawback of a fourdrinier former that transverse profile defects present in the discharge jet may be accentuated further on the fourdrinier wire, for example, due to diagonal flow components in the pulp slurry (so-called plowings on the wire board), or in the form of stronger longitudinal streaks.

It is a common opinion that the variations in grammage in twin gap formers remain lower than in fourdrinier formers or hybrid formers. This is due to the fact

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that in gap formers, the jet is supplied straight into the gap, wherein the pulp jet is immediately "supported" between two wires, so that no transverse flows can arise, which transverse flows would intensify the defects in profile.

When the speeds of paper machines, in particular of newsprint machines, increase, uniformity of the web is, besides being a factor of paper quality, also important, since uniformity of the web has an ever higher effect on the running quality of the paper machine, because the weakest portions of the web are, as a rule, the cause of the breaks.

### SUMMARY OF THE INVENTION

The principal object of the invention is to provide a process and equipment in the forming of a paper web which are suitable for high web speeds up to 1500 m/min, and even higher speeds.

An object of the invention is to provide a process and a former that are particularly well suitable for the production of low-grammage printing papers, such as newsprint and LWC-paper, in particular when the grammage of the papers is within the range of 30 g/m<sup>2</sup> to 60 g/m<sup>2</sup>. Developmental progress is continuously lowering the grammages, which imposes ever higher requirements on the uniformity of paper. At the present time, 45 g/m<sup>2</sup> is common for newsprint, but, in the near future, it will be 40 g/m<sup>2</sup> and lower.

Another object of the invention is to provide a web forming process and a former via which an improved formation and sheet forming is achieved, but in which, nevertheless, a retention of at least equal standard is accomplished as in the prior art formers.

Still another object of the invention is to provide a web forming process and a former via which a uniform distribution of fines and fillers is obtained, so that the opposite surfaces of the web are as equal to each other as possible.

Yet another object of the invention is to provide a web forming process and a former via which the porosity of the paper produced is low whereby there are no so-called pinholes.

Another object of the invention is to provide a web forming process and a former via which the offset printing properties of the paper produced are good.

Still another object of the invention is to provide a web forming process and a former via which a sufficiently high dry solids content is accomplished after the wire section.

The foregoing objects are achieved by the web forming process and the former, whose most important characteristics are described as follows.

The process of the invention comprises the following steps carried out in the following sequence.

(a) The pulp suspension jet is fed from the slice of the headbox of the paper machine into a gap formed by two wires. The gap becomes narrower in the direction of feed of the pulp suspension jet. Water is removed from the pulp web when said web is in compression between the carrying wire and the covering wire within the twin-wire forming zone, which is immediately after the feeding gap.

(b) The twin-wire forming zone is made curved with a relatively large curve radius towards the loop of the carrying wire. The curve radius is selected large enough so that the wire tensioning pressure resulting from it and acting upon the pulp web becomes low and

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the water removed from the pulp web is not, at least not to a disturbing extent, splashed from the inside surface of the wire loop, by the effect of centrifugal force dependent on the curve radius, within the twin-wire forming or dewatering zone.

(c) The joint run of the wires is passed over an open-surfaced forming roller, so as to be curved within a relatively small angle towards the loop of the covering wire.

(d) The joint run of the wires is further passed over a forming roller within a certain sector, so as to be curved towards the loop of the carrying wire.

(e) The formed web is detached from the wire and, in a manner known in itself, is transferred into the press section of the paper machine.

The former of the invention comprises a combination of the following components.

(a) Dewatering equipment is fitted within the twin-wire portion substantially immediately after the forming gap inside the loop of the carrying wire. The dewatering equipment is fitted so as to guide the joint run of the wires, so that such run is curved with a curve radius towards the carrying wire loop. The curve radius is within the range of  $R=5$  m to 50 m, preferably  $R=10$  m to 20 m.

(b) An open-surfaced forming roller is fitted substantially immediately after the dewatering equipment inside the loop of the covering wire. The twin-wire run is arranged on the forming roller so as to be curved within a small angle towards the loop of the covering wire.

(c) A forming roller is fitted in proximity with the forming roller inside the loop of the carrying wire. The joint run of the wires is arranged on the forming roller, so as to be curved towards the loop of the carrying wire within a certain angle.

#### BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference is had to the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a schematic side view of an embodiment of the invention, in which the twin-wire forming zone is substantially horizontal;

FIG. 2 is a schematic side view of another embodiment of the invention, in which the twin-wire forming zone rises diagonally upward;

FIG. 3 is a schematic side view of still another embodiment of the invention, in which the twin-wire forming zone rises vertically;

FIG. 4 is a schematic diagram of an embodiment of the twin-wire forming section and an embodiment of dewatering equipment placed inside the carrying wire loop in the twin-wire forming zone;

FIG. 5 is a schematic diagram of another embodiment of the dewatering equipment;

FIG. 6 is a schematic diagram of an embodiment of twin-wire dewatering equipment in a twin-wire forming zone which rises diagonally upward, as shown in FIG. 2;

FIGS. 7a, b and c are cross-sectional views of different embodiments of deck ribs which are placed in the twin-wire forming zone and which determine the running of the wires; and

FIGS. 8a, b, c, d and e are schematic diagrams of different arrangements of the forming gaps into which pulp suspension is fed.

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#### DESCRIPTION OF PREFERRED EMBODIMENTS

The former shown in FIGS. 1, 2 and 3 includes a carrying wire 10 and a covering wire 20, which have a joint twin-wire forming zone D. The former of the invention is a so-called gap former, in which the wires, converging towards each other as guided by breast rollers 11 and 21, define a forming gap K between the wires. The slice portion 60 of the head box feeds a pulp suspension jet J directly into the forming gap K. A forming roller 12, provided with a suction zone 12a, is inside the loop of the carrying wire 10. The return run of the wire 10, guided by the guide rollers 14, is after the wire 10 drive roller 13. A forming roller 22 is inside the loop of the covering wire 20, after the breast roller 21. The forming roller 22 is a dandy-roller type forming roller provided with a very open surface 23. A dewatering trough 24, which covers the sector b of the roller 12, is provided after the forming roller 22. In the sector b, the wires 10, 20 are curved downwards as guided by the forming roller 12. The covering wire 20 is passed to its return run, which is guided by the guide rollers 26, via the reversing roller 25.

A forming board 30 is provided after the forming gap K between the wires 10 and 20, inside the loop of the carrying wire. The forming board is denoted in FIG. 1, by reference numeral 30a, in FIG. 2, by reference numeral 30b, and in FIG. 3, by reference numeral 30c. The forming board 30 extends from the range of the gap K to the forming roller 22. The forming board 30, which is all the aforementioned forming boards 30a, 30b and 30c, has a certain relatively large curve radius R, whose center of curvature is placed at the side of the carrying wire 10. The dewatering equipment at the forming board 30 may vary within quite wide limits, and some examples of different embodiments of equipment are shown in FIGS. 4, 5, 6 and 7. The centrifugal forces are relatively low at the forming board due to the large curve radius R, so that there is no splashing. As is well known, the dewatering pressure between the wires 10 and 20 is calculated from an equation  $P=T/R$ , wherein T=tension of the covering wire 20, and R=the curve radius of the forming board 30.

Regarding the operation of the forming board 30, the details of which are hereinafter discussed, it should be stated in this connection that water is removed from the pulp web being formed onto the surface of the covering wire 20. However, with a large curve radius R, the water does not fly apart from the wire in the position of the forming board shown in FIG. 1, because the gravitation and surface tensions of the liquid outweigh the centrifugal force. This "floating" of water may, in certain paper qualities, be favorable for the structure and properties of the upper portions of the web. The length L of the forming board 30 is, as a rule, within the range of 2 to 5 m. The curve radius R is usually within the range of  $R=5$  to 50 m; most commonly the applications are found within the range of  $R=10$  to 20 m.

The foregoing curvature R of the twin-wire forming zone D at the forming board 30 also has the important effect that the wires 10 and 20 maintain their posture in the lateral direction, and said wires are not formed into wavelike bag formations, which might occur in a straight twin-wire run.

The former of the present invention is a so-called full-gap former, and does not have a single-wire initial portion, which provides certain advantages. When the

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pulp suspension jet J is fed straight into the gap K, no detrimental transverse flows are generated, but the jet is immediately "supported" between the wires 10 and 20. The orientation of the fibers may be controlled by adjustment of the speed of the jet J relative to the speed of the wires 10, 20.

Dewatering occurs via the carrying wire 10 after the gap K, within the twin-wire portion D. Dewatering usually occurs via both wires 10 and 20, due to the tensioning pressure of the wire 10, in the sector a of the forming roller 22, the magnitude of this sector being within the range of  $\alpha=1^\circ$  to  $50^\circ$ , usually within the range of  $5^\circ$  to  $25^\circ$ . Most of the water running along in the meshes of the covering wire 20 and on the inside surface of its meshes, has access through the open surface 23 of the forming roller 22, and this water flies from the forming roller 22 into the dewatering trough 24 due to the effect of centrifugal force. The magnitude of the sector b of the forming roller 12 is within the range of  $10^\circ$  to  $90^\circ$ , usually within the range of  $30^\circ$  to  $60^\circ$ . The water drained within the sector b is passed into the trough 24, and from there to the sides of the forming section. The suction zone 12a of the forming roller 12 ensures that the web W follows along with the carrying wire 10.

If the forming roller 12 of FIGS. 1, 2 and 3 is not provided with a suction zone 12a, but operates as an open-surfaced or smooth-surfaced forming roller, a separate wire-suction roller with a corresponding wire coverage is required inside the wire loop 10 before the web is transferred into the press section (cf. the suction roller 15 in FIG. 3). In such case, it is possible to use dry suction boxes inside the wire loop 10 on the wire run between the forming rollers 12 and the separate suction roller, in order to ensure the transfer of the web and to increase the dry solids content.

The twin-wire portion, that is, the wires 10 and 20 run substantially together, starts at line A and ends at line B. The web W is detached from the carrying wire 10 in the suction zone 70a of the pick-up roller 70 and transferred to the pick-up felt 71, on which the web W is passed further, in a known manner, into the press section of the paper machine.

The aforescribed forming roller 22, which is preferably a dandy-roller type forming roller, improves the base of the web W by causing an increase in the pressure in the web and shear forces out of the web, as well as removing water in the aforescribed manner. The combined forming and suction roller 12 removes water, by the effect of the tension of the wire 20, through both of the wires and, by the effect of the suction 12a, through the wire 10. If required, it is possible to use suction boxes on the straight run of the carrying wire 10 between the forming and suction roller 12 and the drive roller 13.

The diameter of the forming roller 22 is preferably rather large, 1 to 2 m. The diameter of the forming and suction roller 12, which affects the centrifugal force by which water is removed through the covering wire 20, is usually smaller than that of the forming roller 22, that is, within the range of 0.2 m to 1.5 m. These diameters also depend upon the mechanical strains, for example, on the covering angles a and b.

The length L of the twin-wire draining or forming zone D between the forming gap K and the forming roller 22, in which zone the dewatering equipment 30 is placed, is usually within the range of L=2 m to 6 m. A so-called wedgewise narrowing gap is usually used as

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the gap K. The length of the gap K, as calculated from a plane extending through the axes of rotation of the breast rollers 11 and 21, up to the line A, may be from less than 0.5 m to about 1 m.

The operation of the gently curved forming zone D placed at the forming board 30 and the dewatering equipment provided within the zone D are hereinafter described with reference to FIGS. 4 to 7. Generally speaking, the zone D consists of one or several deck surfaces tensioning the wires 10, 20 with a curve radius R. The openness of the deck surface varies from an almost closed curved deck to a highly open deck construction, assembled from rib-like members, for example. In any case, even the individual ribs or deck surfaces are grouped so as to provide the wires 10, 20 in the forming zone D with a relatively gentle curve radius R, which is as hereinbefore stated, usually within the range of R=5 m to 50 m, preferably 10 m to 20 m. Thus, the centrifugal forces acting in the forming zone D remain low even at high velocities v. The dewatering and formation are promoted in the zone D by the pressure pulsation generated by the alternate open spaces and closed deck surfaces.

The forming board 30a, shown in FIG. 4, and placed in the forming zone D, comprises a forming shoe 31 of a large curve radius R immediately after the gap K. The forming shoe 31 is provided with a smooth-surfaced closed deck 32. After the forming shoe 31, is a forming board 33 having a curve radius R, which is provided with a rib deck 34. Open slots are provided between the ribs of the deck 34. The water may be removed through the slots downwards through the carrying wire 10. A third dewatering member of the forming board is a suction box 35, which is connected to a vacuum system and is provided with a rib deck 36 having transverse slots.

In FIG. 5, the forming board 30a in the forming zone D comprises a rib deck 37 of a certain curve radius R, which is placed immediately after the gap K. The rib deck 37 is provided with transverse open slots between the ribs. A curved shoe, consisting of narrow scraping ribs 38, is provided on the deck 37. A deflector 40 is provided after the shoe 38, inside the loop of the covering wire 20. The deflector 40 is connected via the duct 41 to a suction box 42, which, in turn, is connected to the vacuum system of the paper machine.

In FIG. 6, the upwardly slanting forming zone D, rising at an angle of about  $40^\circ$  to  $60^\circ$ , comprises a closed-surface forming deck 43 inside the carrying wire 10 and thereafter forming ribs. Deflectors 45 are provided at the forming ribs, inside the loop of the covering wire 20, and curved guide surfaces 46 are connected to said deflectors and guide water drained through the meshes in the wire 20 into the collecting trough 47. There is a rib deck 48 after the deflectors 45, inside the wire 10.

The curve radius R does not have to remain unchanged throughout the entire length of the forming zone D. In one possible embodiment, the curve radius is changed continuously or stepwise so that at the end of the forming zone D, next to the gap K, the curve radius is near the upper limit of the range of variation of R=5 to 50 m, and at the final end of said zone, closer to the lower limit. In this way, the dewatering pressure can be increased gradually, and the dewatering made very gentle.

When the run of the wire is closer to horizontal (FIG. 1) than to vertical, the water passing through the cover-

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ing wire 20 can be collected by a separate collecting device, such as a suction box 42 connected with a deflector 40, as in FIG. 5, or the water passing through the wire 20 may be allowed to "float" on said wire and pass through the former roller 22 of a very open surface structure 23, whereupon the water flies, as thrown by centrifugal forces, into dewatering troughs or collecting basins 24 (FIG. 1). The latter mode of removal of the water is possible, because the initial dewatering zone constructed with a larger curve radius R, as compared with the solutions accomplished in the prior art, does not, by means of its centrifugal force, throw the water drained upwards, so that it flies high up. Thus, with a radius R=30 m, for example, the limit velocity at which the centrifugal force surpasses the force of gravitation is

$$v = \sqrt{gR} = \sqrt{9.81 \times 30 \text{ m/s}} = 17.2 \text{ m/s}$$

In reality, the limit speed v is even somewhat higher than that calculated above, because the surface tension and capillary forces of water in the meshes of the wire 20 increase the adhesion of the water to said wire considerably. It can be estimated that the water does not start flying apart from the wire with a radius R=30, even at a speed of almost 25 m/s.

Another advantage that is obtained with the large curve radius R at the same time is the very gentle dewatering, due to the low dewatering pressure  $P=T/R$ . The gentle dewatering is for the purpose of attaining high retention and, at the same time, versatile control of the formation process, because the dewatering has been timed on a relatively long distance. As is known in the prior art, the more highly pressurized dewatering in gap formers occurs within such a short distance that the process cannot be controlled in practice. However, the process is self-controlling, that is, it depends only on pulp conditions and grammage, for example.

The dewatering pressure  $P=T/R$ , and  $P=5/20$  kPa=0.25 kPa, when R=20 m and T=5 kN/m. Ordinarily, in the prior art embodiments of gap formers, the pressure is 1 to 10 kPa, and even the negative foil pressures used in fourdrinier machines are of the same order of magnitude.

The elements of the forming boards 30 may be at least partly adjustable so that the pressing of the individual members perpendicularly against the wires 10, 20 may be varied, so that the pressure pulse of the member concerned may be adjusted thereby. Likewise, the positions of successive members can be varied, so that the main curve radius of the wire run is changed to some extent. Relatively little plays are required in order to change the curvature of large curve radii, within the range of R=5 m to  $\infty$ , for example. The length of the straight portion is, however, limited by the necessity for tensioning the wires 10, 20 in arch form, required as the posture for preventing wrinkling of said wires.

If desired, the dewatering effect can also be intensified by negative pressure by using auxiliary suction in a box provided with a slotted deck, or by placing ribs at the foil angles, as is done, in a manner known in the prior art, with fourdrinier wires. It is also possible to use so-called deflectors at one or both sides of the wires 10, 20, as is shown in FIGS. 5 and 6. A deflector is defined to be a relatively narrow-tipped rib or doctor pressing the wire. As shown in FIG. 5, auxiliary suction in the form of the suction box 42 is used in the deflector 40

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placed inside the loop of the covering wire 20 in order to facilitate the collecting of water. A curved forming surface may also be constructed of wider unified solid or slotted decks and of different combinations of same, as shown in FIGS. 4, 5 and 6. When deflectors 40 and 45 are used inside the loop of the covering wire 20, the main curvature of the wires 10, 20 at said deflectors momentarily becomes a straight line, or even a negative curvature ( $R<0$ ), wherein the center of curvature is shifted to the side of the loop of the covering wire 20, within this limited area.

FIG. 7 shows some examples of the deck ribs forming a curved wire run. Pressure peaks and additional pulsations can be produced in the pulp web W formed, due to the effect of an angular run of the wires 10, 20. This angular run is illustrated in FIG. 7a by the angles  $c_1$  and  $c_2$ , in FIG. 7b by the angle  $c_2$ , and in FIG. 7c by the angle  $c_1$ . As shown in FIG. 7a, the rib 52 has a uniformly curved guide surface. The rib is affixed to the forming board by a groove 53, for example. The rib 51 of FIG. 7b is provided with an edged guide surface. FIG. 7c shows a narrower rib 50 of the deflector type, which is affixed to the forming board by a dovetail portion 54.

The gap K is preferably adjustable, so that the penetration of the headbox jet J between the wires 10, 20 can be controlled.

In FIG. 8a, the gap K is formed by a light wire nip against the breast roller 11. The upper wire 20 contacts the breast roller 11 of the lower wire 10. The gap K can be adjusted by a height adjustment of the breast roller 21 of the upper wire 20, as indicated by an arrow V. The breast roller 11 of the lower wire 10, constituting the counter roller of the wire nip or gap, may be open or smooth-surfaced.

As is shown in FIG. 8b, the breast roller 21 of the upper wire 20 forms the gap or nip against the lower wire 10. The gap K is adjusted by a height adjustment of the upper and/or lower wire 10, 20.

The gap arrangement shown in FIGS. 8a and 8b may also be modified so that the roller forming the gap K does not quite contact the opposite wire, but a gap-like slot remains between the roller and the wire. The slot is completely filled by the discharge jet, whereby pressure is produced, or the nip proper and the formation of pressure start slightly after this position (FIG. 8e). In FIGS. 8a and 8b, in addition to the aforescribed modes, the narrowing of the wires 10, 20 in the gap K can be adjusted by rib-shaped members 62 and 63, as shown in FIG. 8c, considerably more sharply curved than the beginning dewatering and forming zone D, either from one or both sides of the wires 10, 20. In this case, the wires 10, 20 are brought close to each other to form a gap K narrowing in accordance with the draining of water, and the starting point of the nip, that is, the point at which the tension of the wires 10, 20 starts producing pressure on the pulp web, can be adjusted. The direction of the headbox jet J may be adjusted to the side of either one of the wires 10, 20, or to the middle of the gap K, besides the controls shown in the FIGS.

As shown in FIG. 8d, a rib-shaped, curved member 61 is in the gap, against the loop of the wire 20. After the rib-shaped curved member 61, against the inside surface of the wire 10, is a member 49 provided with a closed deck, at least in the initial part, within the area of the gap K.

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The invention is by no means restricted to the aforementioned details which are described only as examples; they may vary within the framework of the invention, as defined in the following claims.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above constructions without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:

1. In a paper machine, a process in the forming of paper web and in the dewatering of pulp web and of paper web being formed, comprising the steps of:
  - feeding a pulp suspension jet from a headbox slice into a gap formed by a looped carrying wire and a looped covering wire, said looped carrying and covering wires having joint runs defining a twin-wire forming zone which begins immediately following said gap and in which a pulp web is formed; passing said twin-wire forming zone over dewatering means situated within the loop of said carrying wire for imparting a first gently curved configuration to an initial portion of said twin-wire forming zone immediately following said gap, the curve defined by said first curved configuration having a radius of a length in the range of between about 5 to 50 meters and extending to the side of said carrying wire so that said initial portion of said twin-wire forming zone is curved towards the carrying wire loop, by which centrifugal forces acting on the pulp web in said initial portion of said twin-wire forming zone passing over said dewatering means is insufficient to cause substantial splashing at an inner face of said covering wire loop; passing an intermediate portion of said twin-wire forming zone over a sector of an open-faced first forming roller situated within the loop of said covering wire substantially immediately after said dewatering means to impart a second curved configuration to said intermediate portion of said twin-wire forming zone which is curved towards said covering wire loop; passing a subsequent portion of said twin-wire forming zone over a sector of a second forming roller situated within the loop of said carrying wire substantially immediately after said first forming roller to impart a third curved configuration to said subsequent portion of said twin-wire forming zone which is curved towards said carrying wire loop in the same direction as the curvature of the initial portion; and detaching the formed web from said forming wire and transferring the web into a press section of the paper machine.
2. A process as claimed in claim 1, wherein said curve radius of said first curved configuration of said twin-wire forming zone is within a range of between about 10 to 20 meters.

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3. A process as claimed in claim 1, wherein said curve radius of said first curved configuration of said twin-wire forming zone is selected so that the dewatering pressure therein is substantially less than about 1 kPa and so that the tension of said carrying and covering wires is of the order of 5 kN/m.

4. A process as claimed in claim 1, further comprising the step of providing pressure pulsation in the pulp web being formed in said twin-wire forming zone.

5. A process as claimed in claim 1, wherein said paper machine further includes a dewatering trough, said process further comprising the steps of transferring water present at the inside surface of the mesh of said covering wire and in the meshes of said wire substantially through or past the open surface of the said first-open faced forming roller via said first open-faced forming roller and removing said water, as thrown by centrifugal forces, over said second forming roller into the dewatering trough inside the loop of said covering wire.

6. A process as claimed in claim 1, wherein said paper machine further includes a suction zone on said second forming roller and a pick-up device, said process further comprising the steps of removing water by negative pressures prevailing in the suction zone at least through said carrying wire and additionally insuring via said negative pressures that, after the twin-wire portion, the web follows along with said carrying wire and detaching said web from said carrying wire via the pick-up device.

7. A process as claimed in claim 1, wherein said paper machine further includes a suction zone on said second forming roller, said process further comprising the steps of deflecting said carrying and covering wires of said intermediate portion of said twin-wire forming zone over an angle in the range of between about 1° to 50° on said first open-faced forming roller, and deflecting said carrying and covering wires of said subsequent portion of said twin-wire forming zone over an angle in the range of between about 10° to 90° on said second forming roller having a suction zone.

8. In a paper machine, apparatus for forming a paper web and dewatering a pulp web and a paper web being formed, comprising:

- a headbox slice;
- a looped carrying wire;
- a looped covering wire;
- said looped carrying and covering wires defining a gap located to receive a pulp suspension jet from the headbox slice, said carrying and covering wires having joint runs defining a twin-wire forming zone beginning immediately after said gap in which a pulp web is formed;

dewatering means situated within the loop of said carrying wire for imparting a first gently curved configuration to an initial portion of said twin-wire forming zone immediately following said gap, the curve defined by first curved configuration having a radius of a length in the range of between about 5 to 50 meters and extending to the side of said carrying wire so that said initial portion of twin-wire forming zone is curved towards the carrying wire loop, by which centrifugal force acting on the pulp web in said initial portion of said twin-wire forming zone passing over said dewatering means is insufficient to cause substantial splashing at an inner face of said covering wire loop; an open-faced first forming roller situated within the loop of said covering wire substantially immedi-

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ately after said dewatering means over a sector of which an intermediate portion of said twin-wire forming zone passes to impart a second curved configuration to said intermediate portion of said twin-wire forming zone which is curved towards said covering wire loop; and

a second forming roller situated within the loop of said carrying wire substantially immediately after said first forming roller over a sector of which a subsequent portion of said twin-wire forming zone passes to impart a third curved configuration to said subsequent portion of said twin-wire forming zone which is curved towards said carrying wire loop in the same direction as the curvature of the initial portion.

9. The combination of claim 8 wherein said dewatering means includes at least one dewatering member situated within said carrying wire loop of the group consisting of a forming shoe having a closed deck, a

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forming shoe having a ribbed deck, a suction box having a ribbed deck, a suction box having a perforated deck and connected to a vacuum system, a deck having a curvature and consisting of ribs, and a curved shoe having narrow ribs.

10. The combination of claim 9 wherein said dewatering means further includes dewatering deflectors situated within said covering wire loop and duct means for connecting said deflectors to a suction system.

11. The combination of claim 8 wherein said second forming roller consists of a combined forming and suction roller having a suction sector over which the joint run of said carrying and covering wires is curved towards the loop of said carrying wire.

12. The combination of claim 8 wherein said radius of said first curved configuration has a length in the range of between about 10 meters to 20 meters.

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# **Exhibit 2**

# United States Patent [19] Koski

[11] Patent Number: 4,925,531

[45] Date of Patent: May 15, 1990

[54] TWIN WIRE FORMER FOR A PAPER MACHINE

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[51] Int. Cl.<sup>5</sup> ..... D21F 1/00

[52] U.S. Cl. .... 162/301; 162/303;

162/352

[58] Field of Search ..... 162/300, 301, 303, 348,  
162/352

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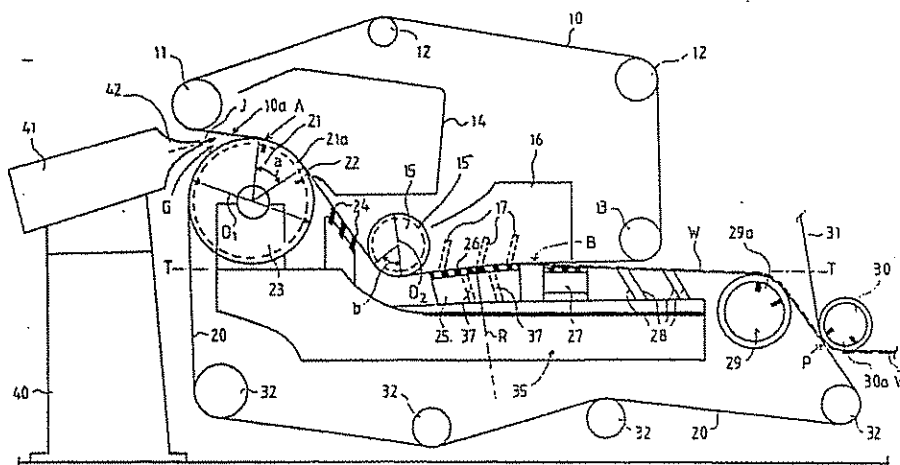
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## [57] ABSTRACT

A twin-wire former for a paper machine having a lower wire and an upper wire. The former has a twin-wire forming zone which has forming members and forming zones situated in a specific sequence as follows. A downwardly curved forming zone is confined to a sector of a large-diameter forming roll mounted on a frame of a lower wire unit, the magnitude of this sector being within the range of  $<90^\circ$ . A second forming roll then follows which is preferably provided with a hollow face and onto which the wires arrive from the first forming roll. The twin-wire forming zone is curved within a certain sector of less than  $90^\circ$  on the second forming roll so as to become horizontal. A forming shoe is provided with a ribbed deck and fitted after the second forming roll inside the lower wire loop, this forming shoe having a relatively large curve radius after which the twin-wire forming zone ends and the web is arranged to follow along with the lower wire.

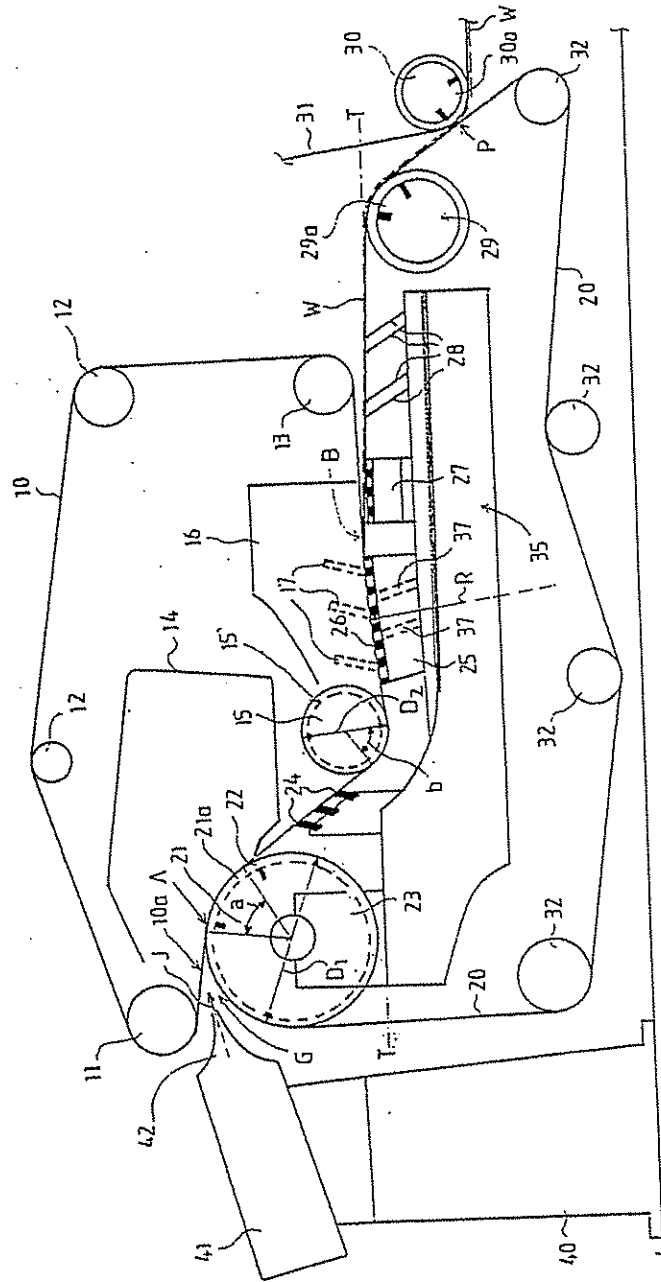
16 Claims, 1 Drawing Sheet



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## TWIN WIRE FORMER FOR A PAPER MACHINE

## BACKGROUND OF THE INVENTION

The present invention concerns a twin-wire former for a paper machine, in particular for rebuilding of existing fourdrinier wire parts. The twin-wire former comprises a lower wire and an upper wire, these wires being guided by guide rolls, by forming rolls, and by a web-forming member. The former comprises a first forming roll at which the lower wire which runs over the first forming roll together with the upper wire, defining a forming gap in connection with the first forming roll, into which a slice part of a headbox feeds a pulp suspension jet.

With respect to the prior art related to the present invention, reference is made to a twin-wire former marked by Valmet under the trademark SPEED-FORMER HHS, which is a gap former principally intended for rebuilding of existing fourdrinier wire parts. A first object of the present invention is to provide a new former concept principally for the same purposes as this SPEED-FORMER HHS.

A starting point of the present invention is a so-called gap former in which, in a gap area, a forming roll or cylinder or relatively large diameter is used.

With respect to further prior art most closely related to the present invention, reference is made to FI Patent Application No. 851035 (Beloit Corporation), corresponding to U.S. Pat. No. 4,209,360 as well as to U.S. Pat. No. 4,209,360 corresponding to SE Pat. No. 7800775-4 (AB Karlstads Mek. Verktad). The objectives of the present invention are partially the same as those of U.S. Pat. No. 4,209,360.

## SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a new type of former which is well-suitable for rebuilding of existing fourdrinier wire parts, i.e. for conversion of such formers to twin-wire formers so that the frame structures, the rolls, and the draining equipment of the old wire unit can be retained to as great an extent as possible.

It is a further object of the present invention to provide a twin-wire former by means of which good retention and formation are obtained and in which unequal-sidedness of the web to be formed is avoided, i.e. the paper web to be produced can be made as symmetric as possible, and such that the web has adequate internal bond strength.

These and other objects are attained by the present invention which is directed to a twin-wire former for a paper machine having a twin-wire forming zone comprising, in the following sequence of twin-wire run,

- (i) a downwardly-curved forming zone confined to a sector of a first forming roll,
- (ii) a second forming roll situated after the first forming roll, being situated at a lower level than the first forming roll, and also arranged to curve the twin-wire zone thereabout to become
  - (a) substantially horizontal,
  - (b) slightly upwardly inclined, or
  - (c) slightly downwardly inclined, and
- (iii) a third forming element fitted after said second forming roll, after which the twin-wire forming zone ends.

More specifically, the first forming roll has a large diameter and the second forming roll has a diameter

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substantially smaller than the diameter of the first forming roll, with the first forming roll being mounted on a frame of a lower wire unit, and magnitude of the sector of the first forming roll being less than about 90°. The first forming roll also comprises a suction zone situated within the sector thereof, with the second forming roll also having a sector for the curving of the twin-wire zone thereabout, which is less than about 90°. Furthermore, the third forming element is

- (1) a forming shoe fitted inside a lower wire loop, mounted on the frame of the lower wire unit, and having a ribbed deck with a relatively large curve radius, or
- (2) a combination of deflectors situated in an upper wire loop and in the lower wire loop.

The twin wire zone is preferably arranged to direct a web formed therein upon a lower wire forming the lower wire loop after the twin-wire zone ends. Preferably, the second forming roll comprises a hollow-face, and the first and second forming rolls are arranged with respect to one another to direct the twin-wire zone as a substantially straight downward run from the first forming roll to the second forming roll. The former comprises a lower wire and an upper wire guided by guide rolls, with the lower and upper wires being arranged to both run over the first forming roll and define a forming gap thereat, into which a slice part of a head box is arranged to feed a pulp suspension jet.

Accordingly, in view of achieving the objects stated above and those which will become apparent below, the present invention is principally characterized by a former comprising a twin-wire forming zone, which comprises the forming members and forming zones situated in the sequence give below:

- (a) a downwardly curved forming zone, which is confined to the sector of a large-diameter forming roll mounted on the frame of the lower wire unit, the magnitude of this sector being within the range of a < 90° and the suction zone of the first forming roll being situated within the area of this sector;

- (b) a second forming roll which is preferably provided with a hollow face, and onto which the wires arrive from the first forming roll preferably as a straight downwardly run, with the diameter of the second forming roll being substantially smaller than the diameter of the first forming roll, the second forming roll being placed at a lower level than the first forming roll, and the twin-wire-forming zone being curved on the second forming roll within a certain sector thereof of less than 90° so as to become substantially horizontal or slightly upwardly or downwardly inclined; and

- (c) a forming shoe provided with a ribbed deck and fitted after the second forming roll inside the lower-wire loop, mounted on the frame construction of the lower wire unit, this forming shoe having a relatively large curve radius, or a corresponding deflector combination after which the twin-forming zone ends and the web is arranged to follow along with the lower wire.

A number of advantages of different directions are carried into effect at the same time by means of the present invention. In the invention, the first forming roll can be supported and journaled on the frame of the lower wire unit, in the case of rebuilding of the existing fourdrinier wire part on the frame, which is an essential advantage as compared, e.g., with the construction of the SPEED-FORMER HHS, in which the corresponding forming roll is supported on the upper wire unit.

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In the construction in accordance with the present invention, the first forming roll is not susceptible to being flooded, because its suction area is on an upper sector of the roll.

The footing constructions of the headbox must be made higher in the case of renewals with the present invention, there being usually adequate space available.

In addition to the principal constructional advantages noted above, the above process-technical objects related to web formation and dewatering are also obtained by means of the present invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in greater detail below with reference to an advantageous exemplary embodiment of the invention illustrated in the accompanying figure, in which

FIG. 1 is a schematic side view of a twin-wire former in accordance with the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

The paper machine former illustrated in FIG. 1 comprises an upper wire unit and a lower wire unit. The upper-wire unit includes an upper wire 10 guided by guide rolls 11, 12, 13 and by forming rolls 21, 15, as well as by a deck 26 of a forming shoe 25. The upper-wire unit further includes frame constructions (not illustrated) and water draining troughs 14, 16.

The lower-wire unit includes a lower wire 20 guided by the forming rolls 21, 15, by the forming shoe 25, and by dewatering members 27, 28 and guide rolls 29 and 32. The lower-wire unit includes a frame, of which a frame part 35 is illustrated in FIG. 1. Bearing supports 23 of the first forming roll 21 are attached on the frame part 35.

When the present invention is applied to modernizing existing fourdrinier formers, it is to a very great extent possible to make use of the existing frame part of the fourdrinier wire, of the draining equipment at the rear end thereof, of rolls 29 and 32, as well as of pick-up roll 30. In the present invention, the forming roll 21 is expressly supported and journaled on the frame part 35 by means of the bearing supports 23, such construction being considerably more advantageous than a construction in which a roll corresponding to the roll 21 would have to be supported and journaled in conjunction with the upper-wire unit.

The upper wire 10 and the lower wire 20 define a twin-forming zone A-B between the same, with water being removed out of the web W that is being formed within this zone through both wires 10 and 20.

After the twin-wire forming zone A-B, starting from a suction box 27 or equivalent, the web W follows the lower wire 20 which thus acts as a so-called carrying wire and carries the web W over a suction zone 29a of the roll 29 to a detaching point P, where the web W is transferred onto a suction zone 30a of the pick-up roll 30 and onto a pick-up felt 31 which carries the web W further to a press section (not illustrated).

The twin-wire forming zone A-B is preceded by a forming gap G which is defined from below by an upper quarter of the forming roll 21 over which the lower wire 20 runs, as well as by a straight run 10a of the upper wire 10 which runs from the guide roll 11 onto the forming roll 21 and onto a pulp web that is being formed. A pulp jet J is fed into the forming gap G

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through a slice part 42 of a head box 41 situated on a stand 40.

After the forming gap G, the twin-wire zone A-B is curved downwardly on a sector a of the forming roll 21. A suction zone 21a of the forming roll 21 is situated substantially within this sector a, this suction zone 21a being defined by laths 22 of a suction chamber which operate against an inner face of the perforated roll mantle. Dewatering takes place mostly through the upper wire 10 on the sector a of the roll 21. Pressure formed between the wires is maintained at an equilibrium by the upper-wire tensioning pressure  $p = 2T_1/D_1$  ( $T_1$  = tensioning of the wire 10). The centrifugal force promotes the draining of water towards the trough 14. Some water may also drain through the lower wire 20 towards the suction zone 21a, partly because of the negative pressure prevailing therein. The amount of this latter dewatering depends upon the level of negative pressure in the suction zone 21a. This level can be regulated to a suitable level so as to adjust ratios of dewatering taking place through the upper wire 10 and the lower wire 20 on the sector a, in view of optimizing the formation of the web W.

The forming sector a is formed by a joint downwardly inclined run of the wires 10 and 20 onto the forming roll 15. On this run and inside a loop of the lower wire 20, there is one or several deflectors 24 which remove water out of the web W that is being formed.

The second forming roll 15 situated inside the loop of the upper wire 10, is a hollow-faced 15' (diameter  $D_2$ ) roll 15 on whose sector b the run of the wires 10, 20 and of the pulp web situated between the same, is turned and becomes substantially horizontal. On the sector b the water is drained by the effect of the lower-wire 20 tensioning pressure  $p = 2D_2/T_2$  ( $T_2$  = tension of the wire 20) and aided by the centrifugal force, the water being drained substantially through the lower wire 20 and to a certain extent also into the hollow face 15' of the forming roll 15 from which the water is thrown into the trough 16.

The forming roll 15 is followed by a forming shoe 25 situated inside a loop of the lower wire 20, the forming shoe being most appropriately provided with a ribbed deck 26. In the direction of running of the wire 10, 20, the deck 26 has a relatively large curve radius R whose center of curvature is at a side of the lower wire 20 as illustrated.

The ribbed deck 26 of the forming shoe 25 is followed by a suction box 27 with a curved deck situated within the loop of the lower wire 20 and ensuring that the web W follows along with the lower wire 20. After the point B of detaching of the web W from the upper wire 10, there may be deflectors 28, dry suction boxes, or other corresponding dewatering members inside the loop of the lower wire 20.

The forming shoe 25 may be substituted with a corresponding deflector combination. Of such possible deflectors, deflector 17 situated inside the upper-wire loop 10 and deflectors 37 situated inside the lower wire loop 20 are illustrated by means of dashed lines in the figure. The deflector 17 and 37 can be alternately situated, preferably so that the twin-wire forming zone guided by the same runs along a very gently meandering, substantially sine-shaped path.

When a forming shoe 25 is used, water is drained principally by the effect of the curve radius R through the upper wire 10 into the trough 16, as well as to a

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certain extent towards the ribbed deck 26 of the shoe 25 being aided by gravity and, if necessary, by suction. The ribbed deck 26 gives the web pressure impulses which improve its formation.

Concerning the different dimensional proportions of the former described above, it can be ascertained that the forming roll 21 or corresponding cylinder has quite a large diameter  $D_1$ , which is as a rule within a range of  $D_1$ =about 800-2000 mm., most appropriately within a range of  $D_1$ =about 1200-1600 mm.

The forming roll 15 that follows after the forming roll 21 has a diameter  $D_2$  which is considerably smaller than the diameter  $D_1$ . The diameter  $D_2$  of the roll 15 is as a rule within the range of  $D_2$ =about 700-1200 mm., most appropriately within the range of  $D_2$ =about 900-1000 mm.

The twin-wire zone sector  $\alpha$  defined on the forming roll 21 in accordance with the present invention, has a width of  $\alpha$  < about  $90^\circ$ , preferably  $\alpha$ =about  $40^\circ$ - $70^\circ$  and most preferably  $\alpha$ =about  $60^\circ$ . The turning sector  $\beta$  of the forming roll 15 provided with a hollow fac 15' is substantially equally as large as the sector  $\alpha$  of the first forming roll 21 which, as a rule, means that the sector  $\alpha$  begins at a topmost point of the roll 21, and the twin-wire zone continues on from the roll 15 to the forming shoe 25 as substantially horizontal.

After the roll 15, the forming zone is substantially horizontal additionally because in this manner it is possible to utilize the frame constructions and the draining equipment of the existing wire part as advantageously as possible. Thus, it is preferred that in the case of rebuilding, the plane of the wire in an existing fourdrinier former joins the plane T-T illustrated in the accompanying FIG. 1. This construction is also advantageous from the point of view that bearing supports 23 of the first forming roll 21 can be mounted on the frame constructions of the existing wire part, most advantageously so that the entire roll 21 is situated above the plane T-T. In such a manner, the stand 40 of the head box 41 must be substantially raised by the dimension of the diameter  $D_1$  of the roll 21.

The curve radius  $R$  of the forming shoe 25 is, as a rule, within a range of  $R$ =about 2000-5000 mm., most appropriately  $R$ =about 3000 mm. The length of the twin-wire zone A-B is as a rule within a range of about 5-8 m.

An axis of rotation of the forming roll 15 is most appropriately at a level somewhat lower than an axis of rotation of the forming roll 21. The forming roll 21 is not susceptible to being flooded, because its suction sector 21a is situated on the upper half of the roll 21.

The overall geometry of the former is most appropriately such that the pulp jet J is discharged from the slice part 42 of the head box 41 as slightly upwardly inclined or substantially horizontally, and such that after the end point B of the twin-wire zone, the run of the lower wire 20 is substantially horizontal.

Various details of the present invention may vary within the scope of the inventive concepts set forth above which have been presented for the sake of example only. In other words, the preceding description of the present invention is merely exemplary, and is not intended to limit the scope thereof in any way.

What is claimed is:

1. A twin-wire former for a paper machine, having a twin-wire forming zone comprising, in the following sequence of twin-wire run,

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- (i) a downwardly curved forming zone confined to a sector of a first forming roll,
  - (ii) said twin wire run comprising a lower wire loop unit and an upper wire loop unit guided by guide rolls, the lower and upper wires being arranged to both run over said first forming roll and define a forming gap thereat, into which a slice part of a headbox is arranged to feed a pulp suspension jet,
  - (iii) a second forming roll situated after said first forming roll, being situated at a lower level than said first forming roll, and also arranged to curve the twin-wire run thereabout to become either
    - (a) substantially horizontal,
    - (b) slightly upwardly inclined, or
    - (c) slightly downwardly inclined, and
  - (iv) a third forming element fitted after said second forming roll, said third forming element being either
    - (1) a forming shoe fitted inside the lower wire loop, mounted on the frame of the lower wire unit, and having a ribbed deck with a relatively large curved radius, or
    - (2) a combination of deflectors situated in the upper wire loop and in the lower wire loop after which the twin-wire forming zone ends and wherein said first forming roll has a large diameter and said second forming roll has a diameter substantially smaller than the diameter of said first forming roll,
- said first forming roll is mounted on a frame of the lower wire unit and is located within the lower wire unit, magnitude of said sector of said first forming roll is less than about  $90^\circ$ , and said second forming roll has a sector for the curving of the twin-wire zone which is less than about  $90^\circ$ .
2. The twin-wire former of claim 1, wherein said first forming roll comprises a suction zone situated within said sector thereof, and said twin-wire zone is arranged to direct a web formed therein upon the lower wire forming the lower wire loop after said twin-wire zone ends.
3. The twin-wire former of claim 2, wherein said second forming roll comprises a hollow-face, and said first and second forming rolls are arranged with respect to one another to direct the twin-wire zone as a substantially straight downward run from said first forming roll to said second forming roll.
4. The twin-wire former of claim 1, wherein said twin-wire zone is arranged to start in an area of a top-most point on said first forming roll.
5. The twin-wire former of claim 2, wherein the magnitude of said sector of said first forming roll is from about  $40^\circ$  to  $70^\circ$ , and the magnitude of said sector of said second forming roll is substantially equal to said first forming roll sector magnitude.
6. The twin-wire former of claim 5, wherein the magnitude of said first forming roll sector is about  $60^\circ$ .
7. The twin-wire former of claim 2, wherein the diameter of said first forming roll is about 800-2,000 mm. and the diameter of the said second forming roll is about 700-1200 mm.
8. The twin-wire former of claim 7, wherein the diameter of said first forming roll is about 1200-1600 mm.,

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and the diameter of said second forming roll is about 900-1000 mm.

9. The twin-wire former of claim 2, wherein said third forming element is said forming shoe with said curve radius of said ribbed deck thereof being about 2000 to 5000 mm

10. The twin-wire former of claim 9, wherein said radius is about 3,000 mm.

11. The twin-wire former of claim 3, additionally comprising

at least one dewatering deflector situated adjacent said substantially straight downward run from said first forming roll to said second forming roll.

12. The twin-wire former of claim 11, wherein said at least one deflector is situated within the lower wire loop.

13. The twin-wire former of claim 2, wherein said third forming element is said deflectors which are ar-

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ranged to guide said twin-wire zone along a gently-meandering, sine-shaped path.

14. The twin-wire former of claim 2, wherein the frame of the lower wire unit is a frame of a four-drinier wire unit, additionally comprising draining equipment situated within the lower wire loop which is draining equipment of the fourdrinier wire unit, and said twin-wire zone is arranged to end such that a plane of the lower wire subsequently carrying the web substantially joins a plane of an upper run of a fourdrinier wire of the fourdrinier unit, said former constituting a rebuilding of existing four-drinier wire parts.

15. The twin-wire former of claim 14, wherein said first forming roll is journaled and supported upon the frame by means of bearing supports.

16. The twin-wire former of claim 15, wherein said first forming roll is journaled to remain entirely above the plane of the upper run of the fourdrinier wire.

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# Exhibit 3



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#B/BK  
8/4-1-97  
P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of  
Rudolf BUCK et al.  
Serial No.: 08/556,769  
Filed: November 2, 1995  
For: TWIN WIRE FORMER

New York, New York  
Date: March 4, 1997  
Group Art Unit: 1303  
Examiner: K. Hastings

Hon. Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

AMENDMENT

Sir:

Responsive to the Office Action dated October 4, 1996,  
please amend the above-identified application as follows:

IN THE CLAIMS:

Please cancel claims 1/4, 7-28 and 31 without  
prejudice.

Please amend the claims as follows:

1. 5. (Amended) A twin-wire former for the production of  
a paper web from a fiber suspension, the twin wire former  
comprising:

first and second web forming wire belts, means for  
directing the wire belts to travel along a path together for  
forming a twin wire zone of the twin wire former, with the web  
between the wire belts as the wire belts travel along the path  
through the twin wire zone, neither wire belt defining a single  
wire predrainage zone;

each wire belt forming an endless loop;  
the twin wire zone having a first section which  
includes a first drainage element at the start of the path

through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, [The twin wire former of claim 1, wherein] the twin wire zone being [is] free of rolls which deflect the twin wire zone.

6. (Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin

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wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element. [The twin wire former of claim 1, wherein] the twin wire zone being [is] free of any forming rolls.

31. (Twice Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone [of a substantial length];

each wire belt forming an endless loop;

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the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the

strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone being free of rolls which deflect the twin wire zone.

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1/30. (Twice Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone [of a substantial length];

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and

are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element; and

the twin wire zone being free of any forming rolls.

Please add the following new claims 32 and 33:

32. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire

zone; a curved drainage element in the first section, the curved drainage element having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and

means for supplying a vacuum in the area of the second drainage strips;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone being free of guide rolls which deflect the twin wire zone and which cause a table roll effect.

33. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; a curved drainage element in the first section, the curved drainage element having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and

means for supplying a vacuum in the area of the second drainage strips;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith;

the twin wire zone being free of solid rolls which deflect the twin wire zone and which cause a table roll effect.--

#### REMARKS

Applicants gratefully appreciate the allowability of claims 5, 6, 29 and 30.

Claims 5, 6, 29 and 30 have been amended to address the Examiner's rejection thereof under 35 U.S.C. §112 and, in the case of claims 5 and 6, to place these claims in independent form. With respect to the rejection under 35 U.S.C. §112 concerning lines 33 and 36 of claim 1, applicants respectfully submit that the present language is clear. Since it does not matter whether the most upstream one of the drainage strips is a first drainage strip or a second drainage strip, the interpretation given to the language by the Examiner is correct and is the intended meaning.

Claims 1-4, 7-28 and 31 have been cancelled and claims 32 and 33 have been added to more adequately protect applicants' invention.

With respect to the double patenting rejection, although applicants do not agree that this is well taken, in order to expedite prosecution of this application, applicants are enclosing herewith Terminal Disclaimers, one relating to U.S. Patent No. 5,389,206 and the other relating to U.S. Patent No. 5,500,091. Accordingly, it is respectfully requested that the rejection of claims 1-31 under the judicially created doctrine of obviousness type double patenting be withdrawn.

Claims 1-31 stand rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103 as being obvious over WO91/02842 or 35 U.S.C. §103 as obvious over WO '842 in view of Halma et al. (U.S. Patent No. 3,994,774). Claims 5, 6, 29 and 30 have been amended to delete the phrase "of a substantial length". Accordingly, WO '842 is not available as prior art against claims 5, 6, 29 and 30. Applicants, therefore, request withdrawal of the rejection of claims 5, 6, 29 and 30 on this ground.

Claims 1-4, 7-28 and 31 were rejected under 35 U.S.C. §103 as being unpatentable over Tissari or Koski in view of DE '133, further in view of Nyman or WO 86/04368 or Nevalainen et al. All of these claims have been cancelled. Accordingly, this rejection is now moot.

With respect to new claims 32 and 33, it is respectfully submitted that these claims are patentable for the same reasons as claims 5, 6, 29 and 30. More specifically, claim 32 specifies that the twin wire zone is free of guide rolls which deflect the twin wire zone and which causes a table roll affect. Support for this limitation may be found on page 5, lines 32 to page 6.

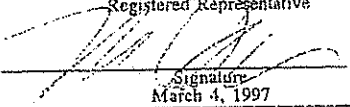
With respect to claim 33 this is the same as claim 32 except "guide rolls" have been changed to "solid rolls". It is believed that this language is supported by the disclosure of a guide roll which, as is well known, has a smooth surface as compared to other rolls, such as forming rolls or suction rolls whose surfaces are generally perforated. Accordingly, it is respectfully submitted that the disclosure of the single species of a guide roll is sufficient support for applicants claim of a solid roll in claim 33. In this connection see MPEP §2164.03 which states:

A single embodiment may provide broad enablement in cases involving predictable factors, such as mechanical or electrical elements. In re Vickers, 141 F.2d 522, 61 USPQ 122 (CCPA 1944); In re Cook, 439 F.2d 730, 169 USPQ 298 (CCPA 1971).

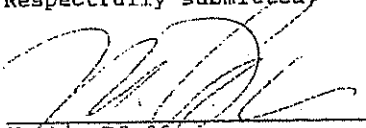
Vickers was also cited as support for a predecessor of Section 2164.03 which stated that: "In mechanical cases, broad claims may properly be supported by a single form of an apparatus or structure". See In re Cook, supra at p. 301. Both Vickers and Cook further hold that the basis for this proposition is that in mechanical cases it is obvious from the disclosure of one species that other species will work, whereas the same is not true in non-predictable arts, such as chemical cases.

In view of the foregoing, it is respectfully submitted that this application is now in condition for allowance. Accordingly, reconsideration and allowance of the application are respectfully requested.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on March 4, 1997:

Martin Pfeffer  
 Name of applicant, assignee or  
 Registered Representative  
  
 Signature  
 March 4, 1997  
 Date of Signature

Respectfully submitted

  
 Martin Pfeffer  
 Registration No.: 20,808  
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MP:rdj:arr  
 Enclosures

# Exhibit 4



UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office  
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Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
05	11/14/07		11/14/07

EXAMINER
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ART UNIT	PAPER NUMBER
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DATE MAILED: 11/14/07

## EXAMINER INTERVIEW SUMMARY RECORD

All participants (applicant, applicant's representative, PTO personnel):

(1) Mr. Pfeiffer (3) \_\_\_\_\_  
(2) Ex. Hastings (4) \_\_\_\_\_

Date of interview: 4-9-07Type: ☒ Telephonic ☐ Personal (copy is given to ☐ applicant ☐ applicant's representative).Exhibit shown or demonstration conducted: ☐ Yes ☒ No. If yes, brief description: \_\_\_\_\_Agreement ☒ was reached with respect to some or all of the claims in question. ☐ was not reached.Claims discussed: 32, 33Identification of prior art discussed: Kosti & Tisari

Description of the general nature of what was agreed to if an agreement was reached, or any other comments: It was agreed to  
cancel claim 33. Applicant proposed amending claim 32, which was  
accepted by the examiner - See Ex. Amolt - to define that only the  
first drainage element <sup>was</sup> a forming roll, but no other rolls  
which <sup>turn wire</sup> reflect the zone are present such as in Kosti (15)

(A fuller description, if necessary, and a copy of the amendments, if available, which the examiner agreed would render the claims allowable must be attached. Also, where no copy of the amendments which would render the claims allowable is available, a summary thereof must be attached.)

☒ 1. It is not necessary for applicant to provide a separate record of the substance of the interview.

Unless the paragraph below has been checked to indicate to the contrary, A FORMAL WRITTEN RESPONSE TO THE LAST OFFICE ACTION IS NOT WAIVED AND MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW (e.g., items 1-7 on the reverse side of this form). If a response to the last Office action has already been filed, then applicant is given one month from this interview date to provide a statement of the substance of the interview.

☐ 2. Since the examiner's interview summary above (including any attachments) reflects a complete response to each of the objections, rejections and requirements that may be present in the last Office action, and since the claims are now allowable, this completed form is considered to fulfill the response requirements of the last Office action. Applicant is not relieved from providing a separate record of the substance of the interview unless box 1 above is also checked.

and Tisari (22/12)  
PTOL-413 (REV. 2-93)

Examiner's Signature

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